

PROGRESSIVE MEDICINE





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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE
MEDICAL AND SURGICAL SCIENCES

EDITED BY
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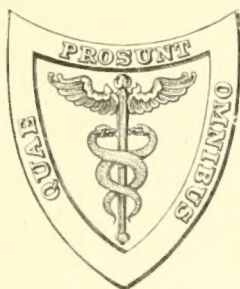
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VOLUME II. JUNE, 1913

HERNIA—SURGERY OF THE ABDOMEN, EXCLUSIVE OF HERNIA—GYNECOLOGY—
DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES.
DISEASES OF THE SPLEEN, THYROID GLAND, NUTRITION, AND
THE LYMPHATIC SYSTEM—OPHTHALMOLOGY.



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PROGRESSIVE MEDICINE

JUNE, 1913

HERNIA

By WILLIAM B. COLEY, M.D.

THE following is a brief **Analysis of the Results of Operations for the Radical Cure of Hernia** at the Hospital for Ruptured and Crippled from December, 1891, to January 1, 1913, covering a total of 3787 operations, of which 2778 were performed for inguinal hernia in the male; 2768 indirect, with 20 recurrences (0.7 per cent.), and 10 direct, with no recurrences. 792 operations were performed for inguinal hernia in the female, namely, 688 indirect, with 11 recurrences (1.6 per cent.), and 4 direct, without recurrence; 156 femoral herniæ, with 3 recurrences (1.3 per cent.); umbilical, 87, with 3 recurrences (3.4 per cent.); ventral, 61, with 10 recurrences (16.4 per cent.); epigastric, 12, with 1 recurrence (8.3 per cent.); lumbar, 1, without recurrence.

As regards the method of operation, the typical Bassini operation was performed in the great majority of the cases of inguinal hernia in the male, *e. g.*, in 2122 cases, with 10 recurrences (0.4 per cent.). In 646 cases, the cord was not transplanted, showing 10 relapses (1.5 per cent.).

Some three years ago we practically abandoned the modified operation without transplantation of the cord, and went back to the typical Bassini method after having made, we believe, sufficient tests to estimate the relative value of the two procedures. The method employed in the cases of inguinal hernia in the female, 692 in number, was the Bassini operation without any attempt to transplant the round ligament. For femoral hernia, the method of high ligation of the sac, and purse-string suture of the canal, by means of a single suture of kangaroo tendon, was used. For umbilical hernia, we have used for a number of years the Mayo or overlapping method with very great improvement over our earlier results; namely, 56 cases of umbilical hernia operated upon by the Mayo method, with 1 recurrence (1.7

per cent.), 31 cases of umbilical hernia operated upon without overlapping, with 2 (6.4 per cent.) of relapses. In 32 cases which were strangulated, there was 1 recurrence or 3.1 per cent.; no deaths; 55 operations were done for the superficial inguinal type with undescended testis without recurrence.

In the cases of inguinal hernia associated with undescended testis, Bassini's operation was performed with exception that the cord was not transplanted in these cases, 205 operations were done, without relapse. The total number of deaths in the entire series of 3787 operations was 8 (0.21 per cent.).



FIG. 1.—Sac laid open to show position of cecum with lines of incision. (An excessive amount of the anterior wall of the sac has been removed to show details.)

Extrasaccular Hernia. Three very valuable papers on extrasaccular hernia have been published during the last year; one by Albert J. Walton,¹ of London, the second by Finsterer,² and the third by Ransohoff.³

Walton has operated upon 4 cases of extrasaccular hernia, and has devised a method of operation which he has used on three occasions.

¹ *Annals of Surgery*, January, 1913.

² *Beitr. z. klin. Chir.*, November, 1912, Band lxxxi.

³ *Annals of Surgery*, August, 1912.

At first he believed it new, but careful search of the literature showed it to be a modification of a method previously advocated. The various steps of the operation are as follows:

Usual incision, slitting up of aponeurosis of external oblique, exposure of sac and freeing same from surrounding structures of cord; fundus incised and opening enlarged, exposing contents (Fig. 1). Division of sac with scissors on posterior aspect to within one-half inch of caput ceci, the incision being then carried along either side of the cecum as far as the neck of the sac, at a distance of one-half inch from the lateral walls of the cecum. On pulling the cecum forward, two flaps of peritoneum are thus seen (Fig. 2), which are sutured



FIG. 2.—Cecum pulled forward to show peritoneal flaps.

together so as to surround the bare posterior surface of the cecum, and the two edges of the divided sac are also sutured together behind the cecum. The latter now lies free in the sac, and can be readily reduced into the abdomen. The sac, being restored, can be invaginated and pushed through the internal oblique by Kocher's second method. In this way the neck of the sac, with the attached part of cecum, is pulled up well away from the internal ring, while the freed cecum is returned to the abdominal cavity. The muscular and aponeurotic wall is then carefully restored.

In the 3 cases treated by the foregoing method, operated upon

between September, 1910, and April, 1911, there has been no sign of a recurrence, although one patient was aged sixty-eight years, and the two others have returned to hard labor since. In another case, operated upon in November, 1909, in which he performed simple closure of the sac, reduction of the gut and suture of the muscles, there is a definite return of swelling and pain.

EXTRASACCCULAR HERNIA WITH BLADDER HERNIA. Walton also gives a careful review of the whole subject of extrasaccular hernia. The commonest variety of extrasaccular hernia is that *associated with hernia of the bladder*. He calls attention to the fact that the catheter is an important aid to diagnosis. This was first advocated by Guy de Chauliac, in 1363, but seems to have been forgotten by the later writers upon hernia of the bladder.

McAdam Eccles,¹ in 1900, described three varieties of hernia of the bladder, *i. e.* (1) With peritoneal covering; (2) where the bladder forms part of the wall of the sac; (3) where the bladder descends without any peritoneal covering whatever.

The bladder, though more commonly found in inguinal hernia, has been observed in femoral hernia in a considerable number of cases. Moynihan² collected 29 cases, 2 males and 27 females. A large proportion of individual cases have been added to this list in more recent years. Walton believes, with Erdmann, that it is now recognized that the bladder is more commonly prolapsed in the femoral than the inguinal variety of hernia.

Personally, I do not agree with this opinion.

At the Hospital for Ruptured and Crippled, in 3787 operations for hernia since 1890, there have been 9 cases of hernia of the bladder, and of these only 1 was femoral.

The diagnosis of hernia of the bladder is seldom made before operation.

Hernia of the Cecum was recognized as far back as 1814, when Scarpa described some cases. Many cases have been reported since, and much has been written about hernia of the cecum. The various types of cecal hernia are well shown by the accompanying illustrations. Walton states as follows:

“The developmental changes occurring in and around the cecum throw considerable light upon the presence of these different types. The cecum develops as a small diverticulum as early as the end of the first month of fetal life; that is, before the axial rotation of the gut is complete and while there is still a common mesentery. It thus happens that the cecum itself, which is usually about $2\frac{1}{2}$ inches long, has a complete covering of peritoneum and has no mesentery attached to it, but lies free in the peritoneal cavity.

¹ Hernia: Its Etiology, Symptoms, and Treatment.

² Arris and Gale Lecture, 1900.

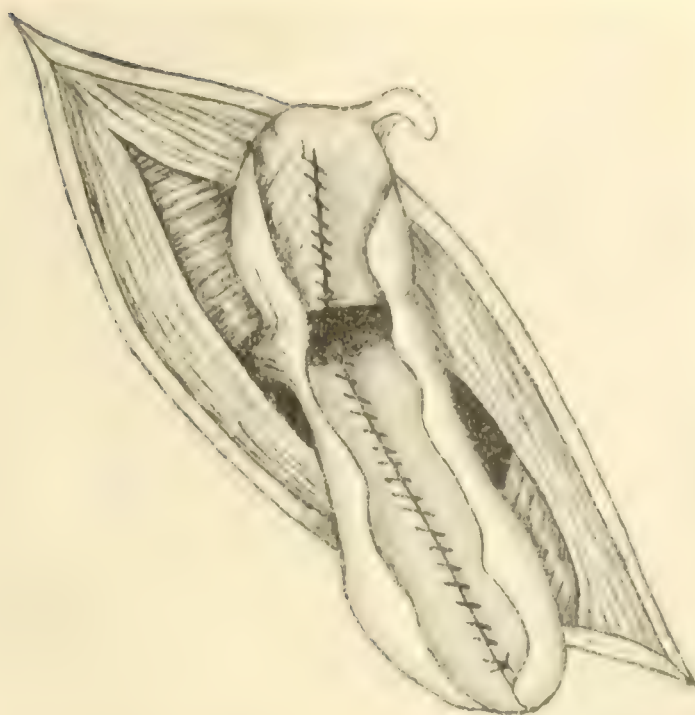


FIG. 3.—Suture of peritoneal flaps on cecum and restoration of sac.

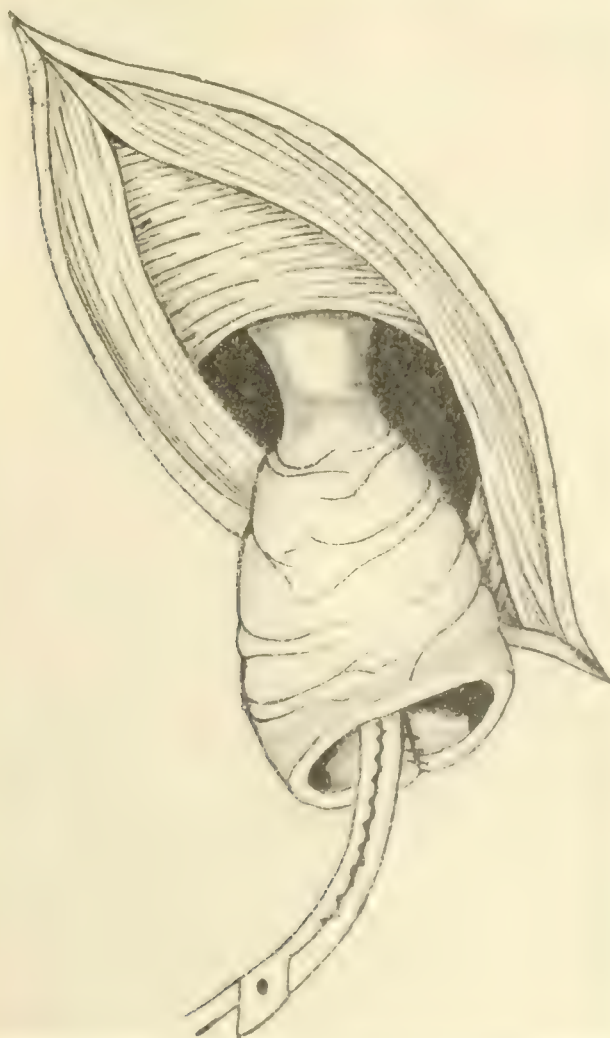


FIG. 4.—Freed cecum reduced. Commencing invagination of reconstructed sac.

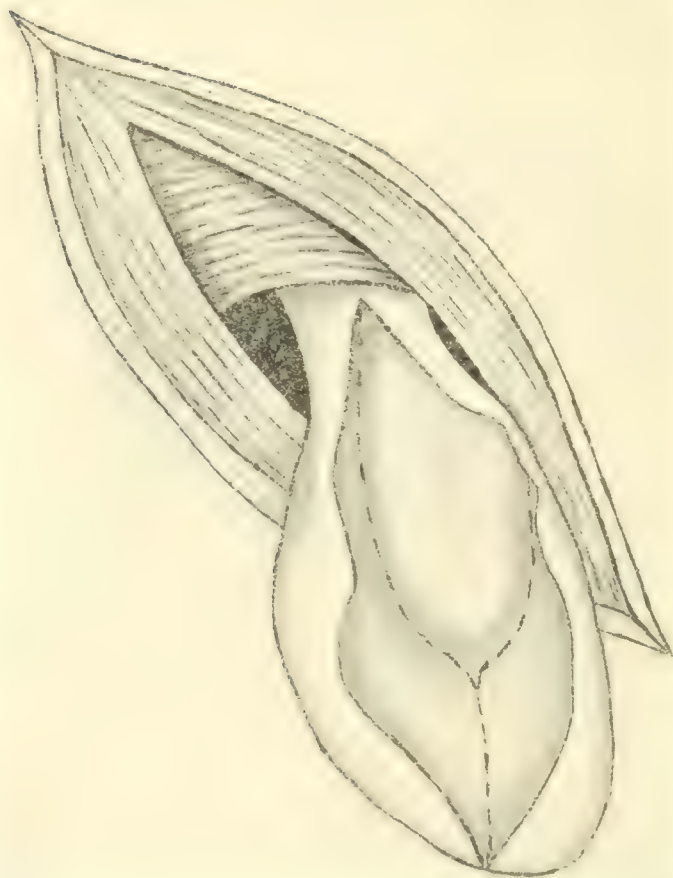


FIG. 5.—Sac laid open to show position of bladder. Line of incision indicated.

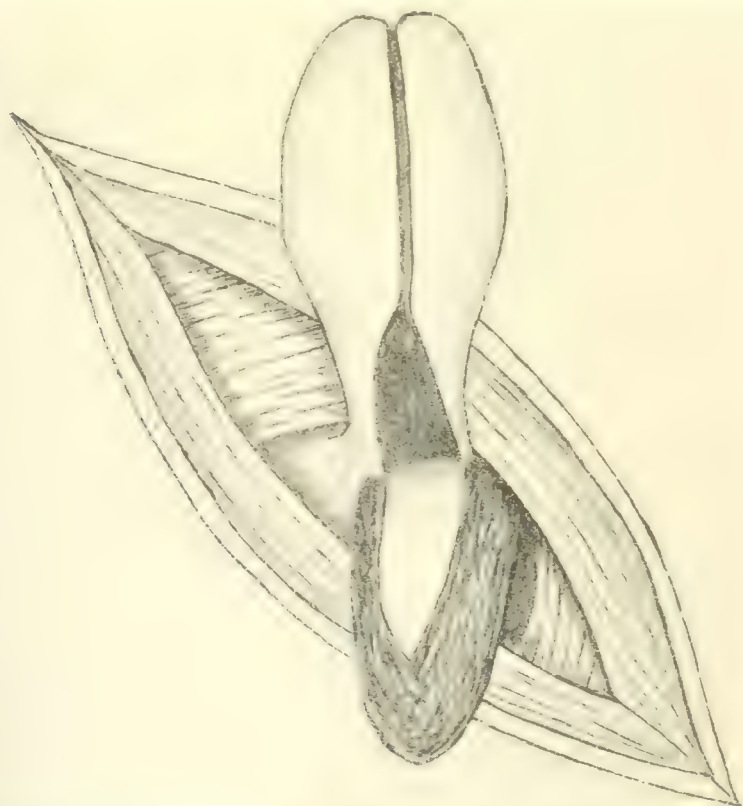


FIG. 6.—Bladder pulled downward and sac upward.

"In early embryonic life the whole of the large gut has one common mesentery, which persists until the seventh week, when axial rotation of the U-shaped loop takes place, by which means the cecum is carried over to the right side of the abdomen. At this stage then the ascending colon has a well-defined mesentery, while the cecum forms a free diverticulum covered with peritoneum. The ascending colon now falls over to the right, so that the lateral aspect of its mesentery comes to lie in contact with peritoneum covering the posterior abdominal wall. These two layers then fuse and become absorbed, so that the peritoneum comes to be directly reflected off from the cecum onto the

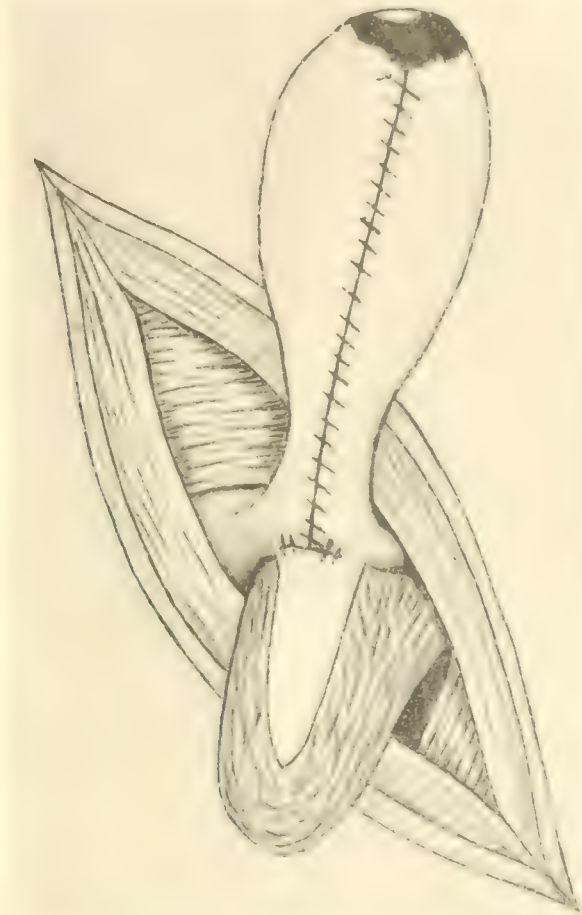


FIG. 7.—Sac reconstructed and ready to be invaginated. Bladder freed, displaced outside sac, and ready to be returned to cave of Retzius.

posterior abdominal wall, and the usual condition is one of only a partial covering of peritoneum for the ascending colon while the cecum is free. In a small number of cases the colon may retain its mesentery, and Carnett¹ states that always in the newly born, and usually in the adult, the two adherent layers can be separated and the primitive mesocolon reestablished.

"As the cecum falls over to the right, the appendix may get caught

¹ *Annals of Surgery*, April, 1909, p. 491.

between the two layers and come to occupy an extraperitoneal position. In addition to these changes, the ascending colon may, after fusion has taken place, again develop a mesentery, in its lower part at least, probably by stretching of the peritoneal folds. In a certain proportion of cases—according to Jonnesco,¹ 8 per cent.—the cecum may, in its upper part, undergo changes similar to those of the ascending colon, so that it also may be in part uncovered by peritoneum.

“A consideration of the above factors makes it clear that many different varieties of hernia of the cecum may take place, and, as Sobotta² has shown, the cecum, when distended, lies in contact with the anterior abdominal wall, so that its appearance in the sac of an inguinal hernia is not unlikely. Although most common in an inguinal hernia, this viscus may also pass through the femoral opening. The statistics of Hildebrand³ and Gibbon⁴ combined by Carnett, showed 164 inguinal and 21 femoral varieties.”

The condition found at operation will, of necessity, be one of the three following types: (1) *Simple hernia*, in which the cecum has descended into the hernial sac in a manner identical with any coil of small gut; (2) *extrasaccular hernia*, presupposing the presence of a sac, but the cecum or ascending colon is either definitely outside the sac in part, or the mesentery of these structures is firmly attached to a portion of the sac, so that simple reduction becomes impossible; (3) *sacless hernia*, a condition which is very rare, and the presence of the large intestine from the pull of a large sac would give no reason to believe that such a condition could occur. Sir F. Treves went so far as to state that a sac was always present. Walton holds, however, that cases undoubtedly occur in which there is no trace of a sac.

Walton found that, in the majority of cases, the cecal hernia is found on the right side, although Foerster collected 54 cases that occurred on the left side, in most of which the cecum was intrasaccular.

As regards *symptoms*, Walton states that they are even less well-defined than in the case of hernia of the bladder, and the diagnosis is practically never made before operation. In simple hernia of the cecum, there will be nothing characteristic, unless the appendix can be felt within the sac, as may sometimes happen in children. In the other two types, suspicion should be aroused if there be a large hernia of long standing which is in part irreducible. It may be possible to distinguish it from a hernia of the bladder, apart from the presence of urinary symptoms of the latter, if the irreducible portion is noticed to lie to the outer side of the reducible part; the reverse being true in the case of bladder hernia.

¹ Poerier and Charpey, *Traite d'anat. Humaine*, vol. iv, p. 336.

² McMurrich, *Atlas and Text-book of Anatomy*, 1906.

³ *Deutsch. Zeitschr. f. Chir.*, 1892, xxxiii, p. 182.

⁴ *Journal of American Medical Association*, 1898, xxx, p. 1385.

With reference to *treatment*, Walton states that, if there be a simple hernia, the gut can be reduced in a manner identical with that of the small gut and the sac closed in the usual way. If the gut be fixed to the sac by its mesentery, or be in part extrasaccular, the operation described above will answer nicely. In all cases, sufficiently wide flaps of sac should be taken, so that, when folded back, the gut is not constricted. It is of the greatest importance that the abdominal wall be firmly repaired.

Sliding Hernia of the Large Intestines. A valuable contribution to the knowledge of sliding hernia of the large intestine has recently been made by Finsterer.¹

According to Finsterer, a sliding hernia is a hernia in which the gut either has but a very short mesentery which is inserted in the sac itself so that the vessels pass from here to the wall of the gut; or, no mesentery at all is found, and the gut has become attached to the wall of the sac in such a way that the visceral peritoneum of the gut partially forms the envelope of the small hernial sac, until the latter finally becomes so small that there is no longer any bulging noticeable. This shows that sliding hernia, and hernia of the large intestine, are by no means identical. Finsterer reports 3 personal cases, one a very rare and instructive case of sliding hernia of the ascending colon, operated upon during his service at the Graz Clinic (v. Hacker); another operated upon at Hohenegg's Clinic, and a very rare case of appendicocele.

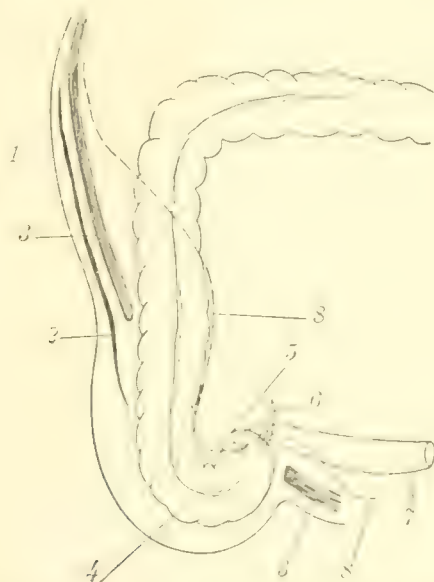


FIG. 8.—1, skin; 2, aponeurosis of external oblique muscle; 3, external oblique muscle; 4, deepest point of prolapsed ascending colon; 5, fundus of cecum turned upward; 6, appendix; 7, ileum; 8, viscera peritoneum passing into parietal peritoneum.

CASE I.—E. J., male, aged fifty-three years; October 28, to November 24, 1908. Operation: Bassini's incision was made, isolation of

¹ Beit. z. klin. Chir., November, 1912, Band lxxxi, p. 198.

the supposed hernial sac was accomplished with great difficulty after splitting the aponeurosis and cremaster. The hernial tumor was found to consist of cecum and ascending colon, the latter being the lowest point, *i. e.*, 5 to 6 cm. from the place of insertion of the ileum (Fig. 8). The ileum was divided 20 cm. from the cecum and its proximal end, and after closure of the lumen, was transplanted into the transverse colon by lateral anastomosis. The patient made a good recovery. The resected parts consist of 15 cm. of large intestine, and 20 cm. of ileum; the large intestine was absolutely free from peritoneum; only the anterior surface of the cecum was covered by peritoneum over an area of 3 by 4 cm.; the appendix was covered in its distal portion only, and showed a distinct mesenterium.

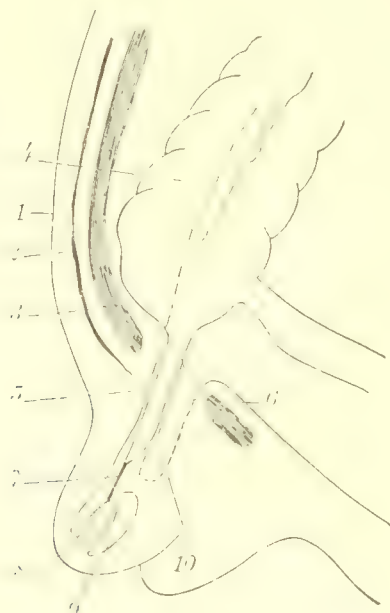


FIG. 9.—1, skin; 2, aponeurosis of external oblique muscle; 3, retroperitoneal portion of ascending colon and cecum; 5, vas deferens adherent to appendix; 6, appendix; 7, cord running from tip of appendix to testicle; 8, testicle; 9, tunica vaginalis; 10, hernial sac.

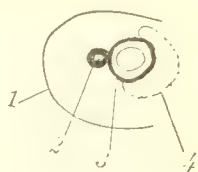


FIG. 10.—Transverse section through hernia. 1, skin; 2, vas deferens; 3, appendix; 4, hernial sac.

CASE II.—A boy, aged eight years; May 30 to June 19, 1911. Operation: After splitting the fascia and cremaster, a delicate hernial sac was encountered. It was found empty and reached down to the testicle from which, however, it was separated. In the lateral wall of the sac was found embedded a coarse, round cord which had the “feel”

of a greatly thickened vas deferens. From the tip of the same, a band 2 cm. long could be traced to the upper pole of the testicle. Upon pulling at the sac, the cecum appeared in the internal ring, and the cord-like formation appeared to be the appendix (Fig. 9). The latter emerged in the wall of the hernial sac and was only half covered by peritoneum, while the lateral side was adherent to the vas deferens (Fig. 10). The patient made a good recovery.

CASE III.—A boy, aged six months; February 26 to March 4, 1912. The parents had noticed a small tumor in the inguinal region since the first month after birth; this was reducible up to thirty-six hours before. There was vomiting; no stools; no flatus. Operation, February 26, 1912: After dissecting free the sac, it was seen that the incarceration was produced by the external ring. Contents: Lowest loop of ileum and

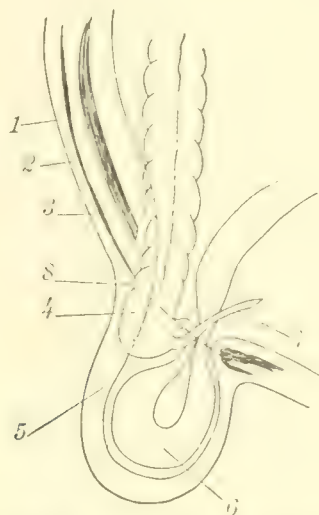


FIG. 11.—1, skin; 2, aponeurosis of external oblique; 3, external oblique; 4, extra-peritoneal portion of cecum and ascending colon incarcerated in hernia; 5, hernial sac; 6, incarcerated loop of ileum; 7, appendix incarcerated in its proximal part, free distally, projecting into abdominal cavity; 8, course of incarceration through, caused by the external inguinal ring.

cecum, both were discolored, and also the proximal portion of appendix; the testicle was outside of the sac. The lateral wall of the tumor was greatly thickened. It seemed to be formed not by peritoneum, but by a portion of large intestine. The constriction ring passed over the ascending colon, the angle at the junction of ileum and cecum, the middle of the appendix, and the lowest portion of ileum (Fig. 11). Only the fundus and tip of the appendix were found intraperitoneally. Amputation of the appendix, and extirpation of the hernial sac was done. The cecum was replaced in the abdominal cavity; the recovery was uninterrupted.

Finisterer refers to Hilgenreiner's statistics of 1910, covering 2238 operations for hernia performed within the last fifteen years, of which 84 were herniæ of the large intestine, but in only 8 of these is any

mention made of the cecum forming part of the sac. On the basis of this, Finsterer states, the frequency of sliding hernia of the cecum would be 0.35 per cent., and that of incarcerated sliding hernia of the cecum (2 cases) 0.1 per cent.

Brenner, in his report of 3000 hernial operations performed between 1892 and 1906, states that the flexure was encountered 20 times, as a sliding hernia with partial sac and wall of gut partly uncovered by peritoneum, the cecum 39 times. However, as Finsterer states, details are missing, which is to be regretted, as it seems unusual that one author should have so large a number of personal cases.

After a careful review of the cases reported in the literature, Finsterer comes to the conclusion that sliding herniæ without hernial sac, although exceedingly rare, do occur, Jiann's recent claim to the contrary notwithstanding. Finsterer found that sliding herniæ of the large intestine occur at all ages, although their frequency increases with advancing age.

By far the greatest proportion of sliding herniæ are of the inguinal variety. He found only 8 ventral herniæ, and, of these, only 4 were sliding herniæ of the large intestine.

According to Baumgartner, the proportion of inguinal to other types of hernia is 152 to 15.

As regards *therapy* Finsterer states that the usual radical operation for hernia practically meets all requirements, the essential important differences being the danger of injuring the gut before opening the sac, and the impossibility of completely extirpating the sac. The only way to avoid injuring the latter is to always consider the possibility of a sliding hernia with part of the gut located extraperitoneally.

He states that since, in sliding hernia the normal fixation of the large intestine is missing, the danger of recurrence must not be underestimated. Various procedures aiming at the reestablishment of normal fixation of the gut have been proposed.

We do not agree with Finsterer that the usual radical operation for hernia meets all requirements in sliding hernia. There are certain cases in which it may be necessary or wise to utilize some of the special methods of operation which have been devised by men who have made a study of this type of hernia, *e. g.*, the method of Fiachi, of Sidney, already described in *PROGRESSIVE MEDICINE*, June, 1908, which consists in supporting the bowel by sutures placed high up in the abdominal wall above the canal.

Adherent Hernias of the Large Intestines. J. Louis Ransohoff, of Cincinnati, has published an admirable paper on the subject of "Adherent Hernias of the Large Intestine" in the *Annals of Surgery*, August, 1912, p. 313. The paper is an elaborate attempt to prove that previous writers upon sliding hernia have been incorrect in their opinions as to the etiology of this variety of hernia. He states they are practically

all examples of adherent hernia of the large intestine, and not sliding hernias at all. He correctly states that the most widely accepted theory as to the etiology of this form of hernia is that this type of hernia is caused by the "sliding of the gut on the posterior peritoneum." On opening the sac, either cecum and ascending colon in right hernia, or ileopelvic colon or sigmoid in left hernias, will be found. The sac is well-formed and complete on its anterior aspect, but seemingly deficient behind, the bowel being tightly adherent to, and apparently incorporated in, the posterior wall of the sac; hence the designation "hernia with incomplete sac" or "hernia par glissement" as the French term it.

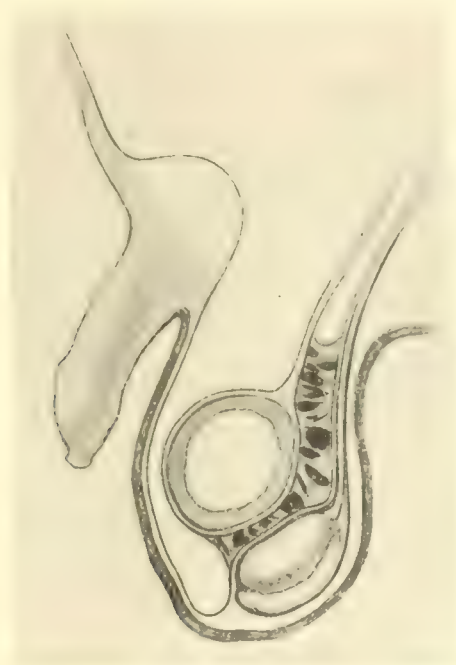


FIG. 12.—Sagittal section of adherent hernia of large intestine, showing adhesions between mesentery, gut, and posterior wall of sac.

Ransohoff attempts to refute the commonly accepted theory that these hernias are due to the sliding of the posterior peritoneum on the underlying cellular tissue, the peritoneum sliding into the internal ring, carrying with it the attached loop of large bowel. He believes this theory untenable, as it is based upon unsound mechanical principles. The ileopelvic colon or sigmoid is, in part, normally attached to the posterior peritoneum at the level of the left sacro-iliac synchondrosis, by a broad fold of peritoneum, which appears deficient on the posterior aspect of the gut. That is, the posterior surface of the bowel is apparently in direct contact with the retro-peritoneal cellular tissue of the ileopelvic fossa. In a certain number of cases, however, the attachment of the ileopelvic colon lies at a lower level, and the anterior leaf of its peritoneal covering is reflected to the anterior abdominal wall just above Poupart's ligament, the posterior

leaf to the posterior abdominal wall just above the internal ring. This brings the posterior uncovered surface of the bowel in direct contact with the internal ring, also uncovered by peritoneum, as its peritoneal covering has been dislocated to the anterior abdominal wall. Any sudden increase in intra-abdominal pressure or prolonged increase, as due to straining at stool, is sufficient to force the knuckle of bowel through the unprotected ring and into the canal. The continuance of pressure forces the gut, dragging the peritoneum behind it, further along the canal into the scrotum. This low position of the sigmoid is supposedly due to the downward dislocation of the peritoneum lining the lower portion of the abdomen. This dislocation is either congenital or has been caused by increased intra-abdominal pressure. It is presumed that the posterior peritoneum has become loosened from its underlying supporting cellular tissue. This theory, accepted by Ranzi, Scarpa, Wier, Stoney, and many others, is utterly fallacious. Even in the opened abdomen, it is no easy task to strip the peritoneum from the abdominal wall, so close is its adherence; in addition to this, any increase in intra-abdominal pressure only serves to apply the parietal peritoneum more closely to the abdominal wall.

If this form of hernia occurred by sliding of the peritoneum on the posterior abdominal wall, there would be a dislocation of the entire posterior peritoneum with the attached gut; whereas, the splenic flexure on the one hand, and the hepatic flexure on the other, are invariably found in their normal anatomical positions. It is true, that Tuffier has reported a case of enormous hernia of the descending colon, where the kidney was dislocated. This, however, was probably due to a dragging of the inferior mesenteric artery on the aorta and the dislocation of the aorta and, through it, a dislocation of the kidney. Again, if this form of hernia occurred by sliding, there would be from the moment of occurrence difficulty in reduction; whereas, in nearly all cases, the history points to the hernia having become irreducible only after months or even years.

But most convincing of all are the few cases in which, without visceral transposition, the cecum has been found adherent in left-sided hernias and the sigmoid in the right hernias. By the utmost stretch of imagination there can be no discussion on this point; the peritoneum on the left side cannot slide into the right inguinal canal, nor *vice versa*. Furthermore, it is almost axiomatic that the *sine qua non* of the development of a hernia of an intestinal coil is the mobility of that coil. If a loop of intestine is found fixed in a hernial sac, it is conclusive proof that before the formation of the hernia the loop was mobile. The sigmoid does not rest on the cellular tissue of the posterior abdominal wall, but is separated from it by a triplicate layer of fused peritoneum. First, the posterior peritoneum itself, second and third, the double layer of adherent mesentery through which the

nutrient vessels of the gut pass (Fig. 15). This same relationship exists between the sac wall and the adherent intestinal coil (Figs. 12 and 13). This fused peritoneum, called by the French the *fascia d'accrolement*, fixes the attached portion of the sigmoid and cecum firmly to the posterior abdominal wall, and itself prevents any possibility of sliding or dislocation.

Ransohoff discusses at considerable length the embryonic development of the large intestine, the object of which is to show that the entire large intestine (distinct) and mesentery lie free in the abdominal cavity. The large intestine forms a horse-shoe, outlining the confines of the peritoneal cavity. Grouped in the centre are the small intestines (Fig. 13). The secondary adhesions, which now form, change the mobile fetal large intestine into the fixed adult type.



FIG. 13.—Cross-section of large intestine, showing adhesions between mesentery, gut, and sac wall, with nutrient vessels in the adherent mesentery.

Peritoneal surfaces have a tendency to adhere when they are held in contact under pressure. The small intestine, and particularly its mesentery, does not adhere to the parietal peritoneum, for two reasons: (1) From the time of the development of the liver in the fifth week, the small intestines are filled with its secretion, and in a state of active peristalsis; (2) its frilled mesentery presents no broad surface for agglutination.

The conditions in the large intestine and its mesentery are the reverse.

1. The broad, flat mesentery stretching on either side from the vertebral column to the large gut rests directly on the posterior parietal peritoneum (Fig. 15). Moreover, as the large bowel is empty and not in active peristalsis, it is immobile.

2. The mesentery is held in contact to the posterior parietal peritoneum not only by the pressure of the filled moving small intestine, but also by intra-abdominal pressure.

3. Still another feature is the increase in local pressure at the site of the projecting kidneys and adrenals, which force the parietal peritoneum in direct contact with the ascending and descending colon.



FIG. 14.—Cross-section through abdomen at third lumbar vertebra, looking toward diaphragm, showing mesentery of ascending and descending colon adherent to posterior abdominal wall.



FIG. 15.—Alimentary tract of embryo of six weeks, showing rudiments of the two mesenteric systems. (After Hertwig.)

The adhesion of mesentery always precedes the adhesion of the bowel; that is, the adhesions begin at the root of the mesenteries and

spread toward the bowel. Failure of the adhesions to be continuous results in the ileocecal fossa on the right side, the parasigmoid on the left (Fig. 14).



FIG. 16.—Embryo of eight weeks, showing large intestine with free mesentery outlining the abdomen.

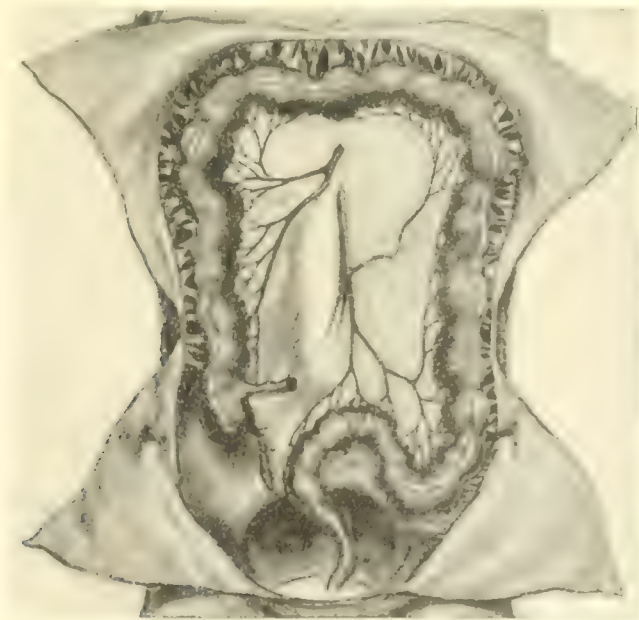


FIG. 17.—Drawing from cadaver, showing the adherence of the entire ascending and descending colon, the adhesions beginning at the hepatic and splenic flexures.

Recapitulating he adds: "After studying the embryology of the large intestine and the secondary adhesions of its mesenteries, the following conclusions may safely be drawn:

"1. So-called herniæ with incomplete sacs do not exist, except as a secondary process.

"2. The sac is complete in its incipency and has been obliterated by secondary adhesions of the embryonal type.

"3. A loop of intestine found in a hernial sac is conclusive proof that originally that loop was mobile.

"4. In adherent hernias of the large intestine, the hernia is primary, the adhesions secondary.

"5. The crux of the situation is the redundant colonic loop."

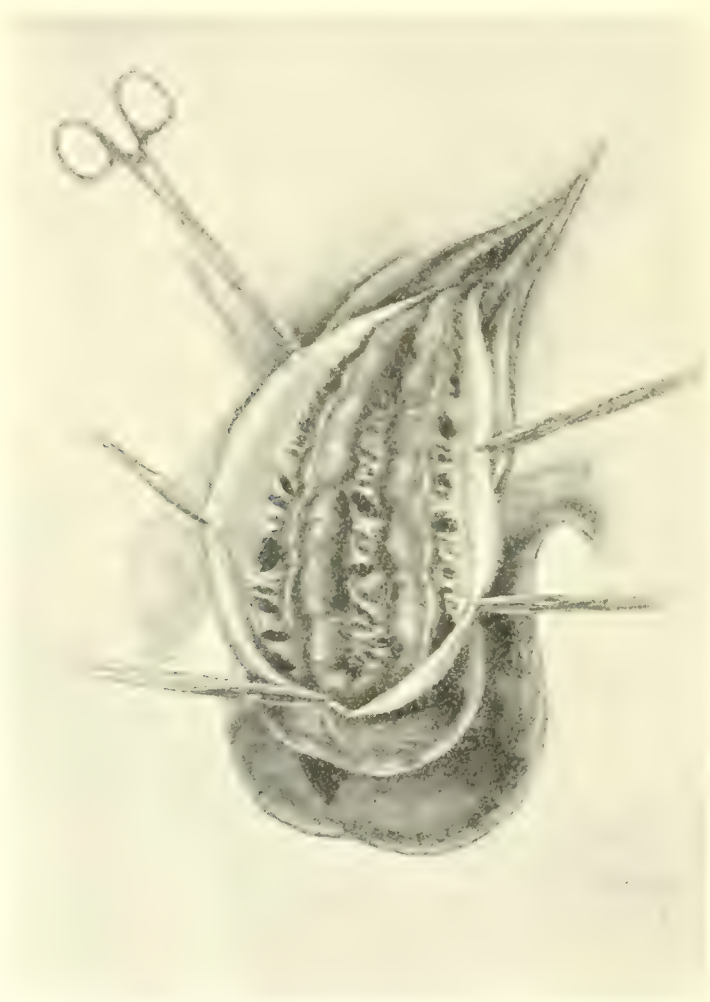


FIG. 18.—Drawing from life, showing the sigmoid adherent in the opened sac.

Personally, I do not believe that the radical conclusions of Ransohoff are proved. The detailed description of the embryonic development of the large intestine is both interesting and, I believe, accurate. Yet his conclusions are by no means a logical deduction from his premises. When saying that herniæ with incomplete sacs do not exist except as a secondary process, he is begging the question. Against the

acceptance of these dogmatic conclusions, based largely upon theoretical data, I would place the careful clinical study of a very considerable number of actual cases of this type of hernia reported by competent observers. I have personally not infrequently watched these cases develop in infants and young children, and finally operated upon them, and found the condition actually present after full development, and I am very positive that, in many of these cases, the sac was never complete at its incipiency and that the posterior wall of the sac was actually a part of the parietal peritoneum rather than a one time mobile



FIG. 19.—Showing method of operating on adherent hernia of sigmoid; peritoneal flap prepared for closure of ring; purse-string and continuous suture for formation of new mesentery almost completed.

cecum had become merely adherent. While it might be impossible to prove absolutely the incorrectness of Ransohoff's views as regards sliding hernia in the *adult*, I have seen a sufficient number of cases in children to make them, in my opinion, untenable in early life. It is possible to agree with Ransohoff that the immobility of the cecum is due to adhesions to the posterior parietal peritoneum, and the only difference between the view of Ransohoff and the older view, which I believe to be correct, is, that Ransohoff believes the adhesions to be postnatal, while the rest of us believe them to be antenatal.

In the *Arch. f. klin. Chir.*, 1911, vol. vi, p. 702, Sprengel gives his experience with sliding hernia.

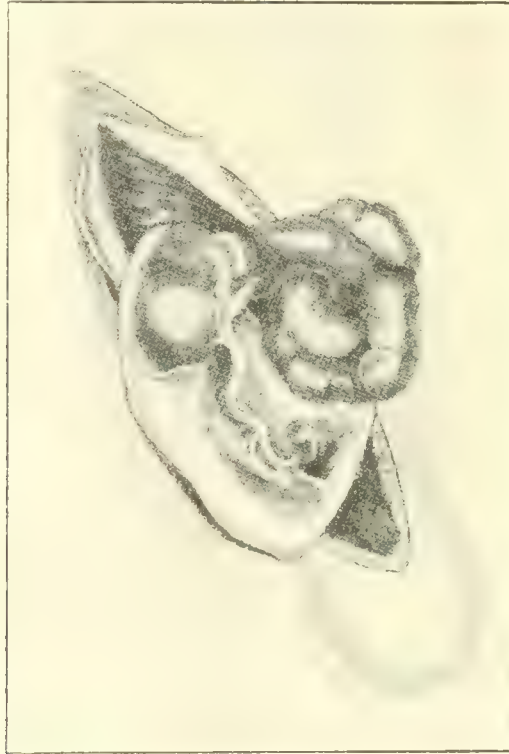


FIG. 20



FIG. 21

As to the relative frequency of this type of hernia, he states that nothing definite is known. Petrovic-Serbien, in 1908, found 14 hernias of the large intestine in 1325 cases operated upon for hernia. Judd,¹ in 1911, 14 in a series of 1652 cases. Baumgartenr (1905) collected

¹ Collected papers by the staff of St. Mary's Hospital.

159 cases of sliding hernia from the literature. Hildebrand (1892) reported a total of 128 cecal hernias, of which 80 were right inguinal



FIG. 22

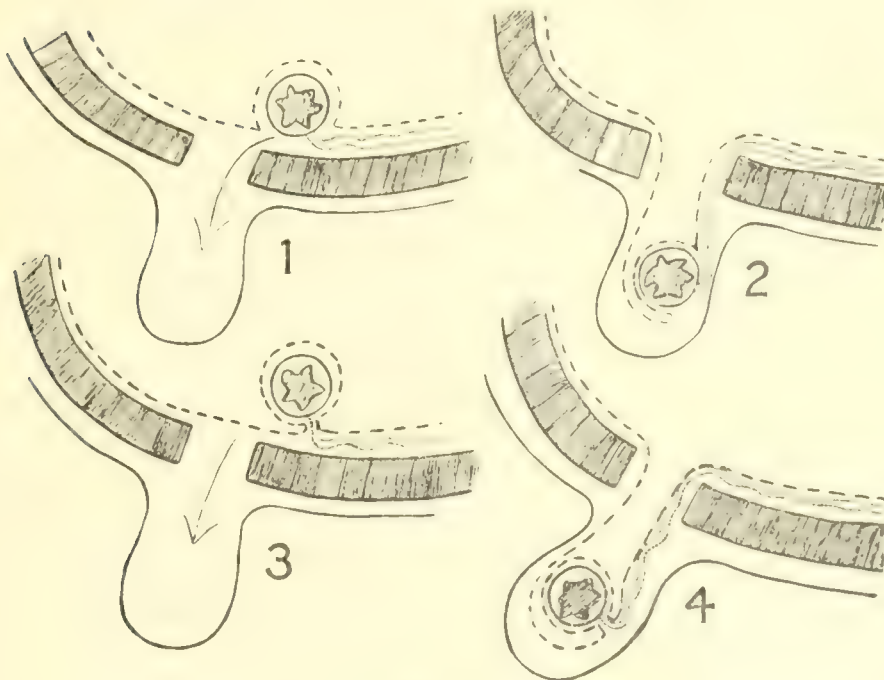


FIG. 23

FIGS. 20, 21, 22, and 23 show the vessels to pass directly from the connective tissue surrounding them into the wall of the gut. They demonstrate at a glance the fundamental difference it must make for the radical cure of a hernia, whether the gut is suspended from a long mesentery in the abdominal cavity, or whether the gut with all its component parts, including the nourishing vessels, has become one with the hernial sac.

hernias with the cecum as contents of the sac. Sprengel observed 13 cases of true sliding hernia (excluding cecal hernia) in a total of 1800 operations done within the last fifteen years.

Sprenghel's definition of true sliding hernia is: "A hernia in which a section of the large intestine without mesocolon, or, but a very small one, has become the contents of the sac." He states that not every hernia of the large intestine is a sliding hernia, nor is every hernia of the vermiform appendix a sliding hernia. He refers to Figs. 20, 21, 22, and 23 as a clear representation of his idea.

The method of operation practised by Sprenghel is briefly as follows: Longitudinal division of the fibers of the cremaster, and careful loosening of the sac from the cord; closure of the sac by suture and, whenever possible, reposition into the abdominal cavity through the sufficiently widened hernial opening. The risk of operation in these cases, is, of course, greater than in ordinary inguinal hernia. Sprenghel reports 3 deaths due to the immediate or after-effects of operation.

Indirect Inguinal Hernia. Laméris, of the Surgical Clinic of the University of Utrecht, publishes an article in the *Deutsche Zeitschrift. f. Chir.* (November, 1912), on the treatment of "Indirect Inguinal hernia." He reports the results in 613 cases of inguinal hernia operated upon strictly according to Bassini. Of these, 511 were indirect hernias, with 20 relapses (3.9 per cent.), 102 were direct hernias, with 29 relapses (28.4 per cent.), showing Bassini's operation far less efficient in the latter type.

He considers the torsion of the neck of the sac of decisive importance as regards permanency of cure, and states that, owing to technical difficulties, torsion was impossible in a number of the relapsed cases of indirect hernia. Dividing his cases into those treated with and those without torsion, the percentage of permanent cures is as follows: 403 cases with torsion of the neck of the sac, 10 recurrences (2.48 per cent.); 108 with simple ligature or suture, with 10 recurrences (9.2 per cent.).

Laméris reports a second series of 700 cases, in which the radical suture was omitted, but as a large proportion of the same were operated upon less than one and one-half years ago, only 443 cases come into consideration in estimating the result. Of these, 423 were operated upon with torsion ligature of the hernial sac, with 17 recurrences (3.9 per cent.); 16 were treated with suture or simple ligature, with 4 recurrences (25 per cent.).

The foregoing figures, he states, speak for themselves. They show that the radical suture or strengthening of the inguinal canal, so far considered as the most important part of the radical operation for inguinal hernia by practically all authors, is really of little value, and that whenever the torsion ligature is not done, the chances of a recurrence are greatly increased. In other words, Laméris believes that the more thoroughly it is possible to remove the sac and the parietal peritoneum surrounding its neck, the greater the probability of securing a radical cure in oblique inguinal hernia. In conclusion, he states

that any kind of radical suture or plastic operation within the inguinal canal is to be regarded as superfluous.

Laméris, I believe, rests his conclusions upon too slender a basis of facts. To state that because 423 cases operated upon with torsion ligature showed only 3.9 per cent. recurrences, while 16 operated upon with suture and simple ligature, had 25 per cent. recurrences, the torsion of the hernial sac is proved to be of great value, would seem an illogical conclusion. We might, in turn, cite the statistics of the Hospital for Ruptured and Crippled, comprising 3456 cases of indirect hernia, in which we never used torsion of the sac, but always suture or simple ligature, with 1 per cent. of recurrences, and, comparing these with Laméris' cases in which torsion of the sac was used, with 3.9 per cent., prove the opposite contention, *i. e.*, that suture yields better results than torsion. As a matter of fact, I do not believe that it makes the slightest difference whether suture, simple ligature, or torsion is used in closing the sac, provided the closure is made flush with the abdominal cavity, which constitutes one of the most important steps in the radical cure of hernia by any method. If the sac is thoroughly freed high up beyond the internal ring and tied off at the point stated and the wound closed by Bassini's method, under the best technique, the number of recurrences in oblique hernia should not be over 2 to 5 per cent.

In direct hernia, torsion of the neck of the sac is out of the question, and the 28 per cent. of relapses in 102 cases of direct hernia reported by Laméris, show a very imperfect understanding or application of the most approved method of treating this type of hernia, by making use of the rectus muscle, according to the method proposed by Woelfler and later by Bloodgood, with variations and improvements more recently suggested by Dr. Wm. A. Downes, of New York. The number of recurrences, in this at one time most difficult type of hernia to cure, should be considerably less than 10 per cent.

Oblique Inguinal Hernia. In his "Contribution to the Treatment of Oblique Inguinal Hernia," Torék¹ describes a procedure practised by himself for the last seven years, with such uniformly satisfactory results that he has come to consider it superior to Bassini's method.

Torék states that the operations now in vogue for the radical cure of inguinal hernia, omit to take into consideration one important anatomical factor, and that is, the relative position of the vas deferens and bloodvessels which, he avers, if not changed by the operation, furnish the predisposition to a recurrence. In their normal course from below and above, respectively, to the point of union at the internal ring, the vas deferens and bloodvessels of the spermatic cord form the sides of a wedge-shaped area (Figs. 24 and 25) so that any repeated pressure from behind forward, can easily force them apart. A loop of

¹ Deut. Zeit. f. Chir., September, 1912.

continuation of this relative position of vas deferens and bloodvessels after operation, Torék pushes them still farther apart and makes the vas deferens and vessels emerge separately through the row of sutures, uniting the internal oblique and transversalis fascia with Poupart's ligament (Fig. 26). The vessels are brought out at the top, the cord at least 2 cm. farther down, and the remaining sutures are placed below the vas deferens as far down as the pubic bone. The foregoing represents the principal features of Torék's method.

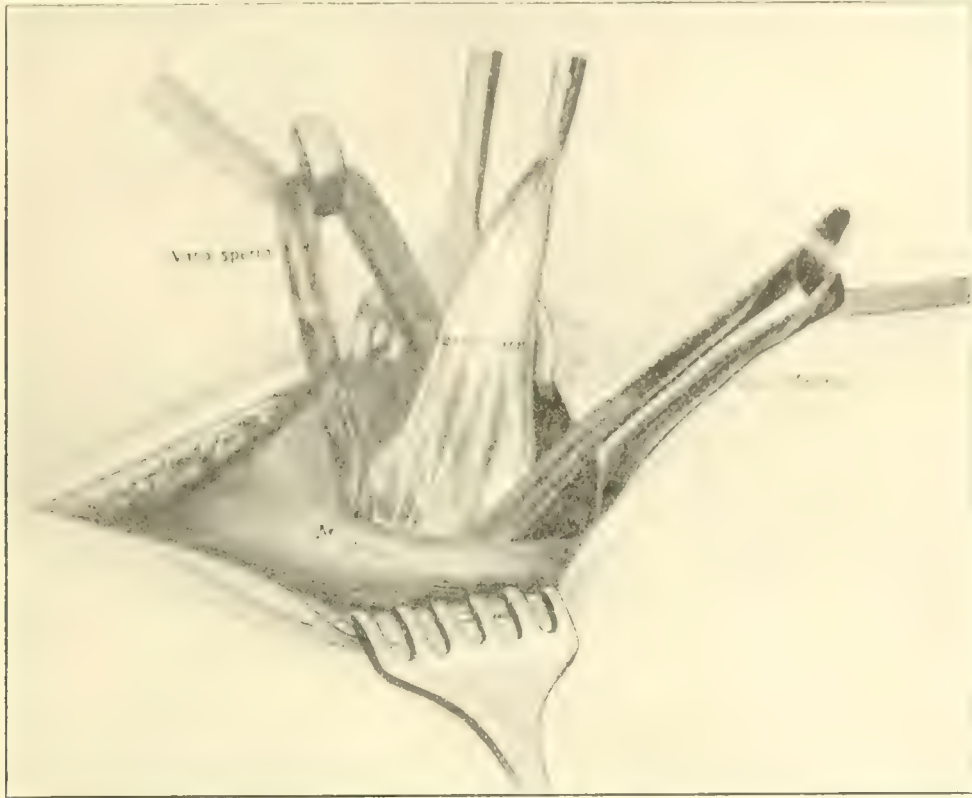


FIG. 26

I believe that the danger which Torék's modification is attempting to remedy is a purely theoretical one, without any practical weight. The relative position of the vas deferens and spermatic vessels before operation is of little, or no, importance. As a matter of fact, in the ordinary oblique inguinal hernia, the vas and cord are spread out in a fan-like manner over the whole posterior wall of the sac, often occupying an area of 1 by 1.5 inches in area, and in performing the typical Bassini operation, the cord and vas are gathered together in a loose cord of several strands and transplanted into the upper angle of the wound. They are all more or less held together by a thin infundibular layer of fascia, which spreads them over the sac itself. Personally, I believe it much better to transplant them in one single mass, according to the Bassini method, than to separate the vas from the cord which would necessarily entail more or less extra trauma, wounding the small veins. If a suture is put directly above the cord, as I have advocated

for the last twenty years, it is possible to get at least 98 per cent. of permanent cures with the typical Bassini method.

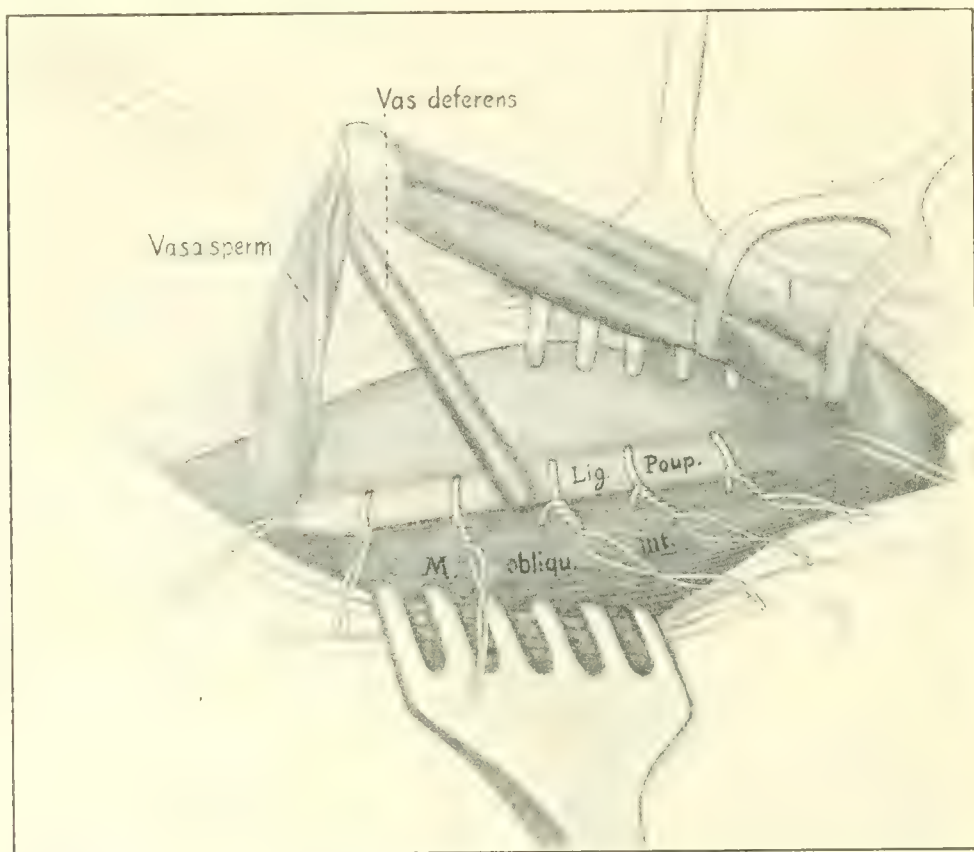


FIG. 27

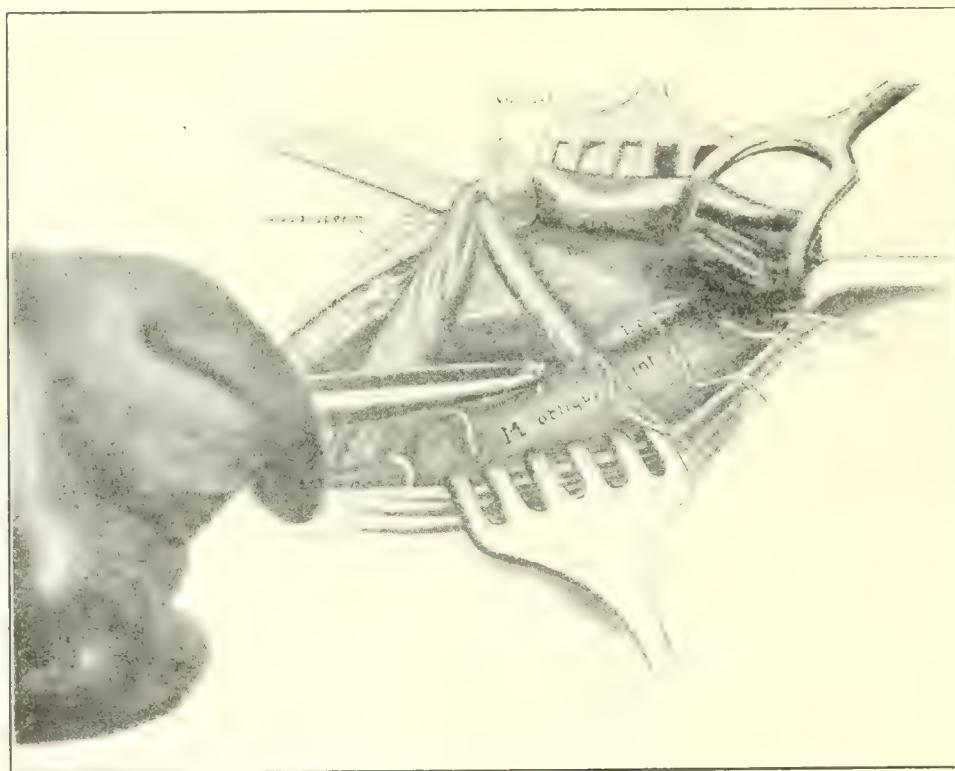


FIG. 28

I would again most strongly protest against the use of silver wire in any form of hernia, but particularly in the inguinal type.

New Method of Hernia Operation. A new method of operation upon hernia from the peritoneal side of the abdominal wall has been reported by E. H. Beckman,¹ of the Mayo Clinic at Rochester, Minn.

He states that for a number of years, when operating for abdominal conditions in patients also suffering from either femoral, inguinal, or umbilical hernia, an attempt has been made to repair these hernias from within the abdomen, provided they were not of enormous size. The first variety of hernia operated upon by this method was the femoral.

The method consists in introducing a pair of artery forceps through the hernial ring from within the abdomen to the bottom of the sac, grasping it and pulling it back into the abdomen. Two or three mattress sutures of heavy linen or silk are then passed completely through the neck of the sac and tied. The remaining portion of the sac is then either excised or stitched to the abdominal wall. Beckman states that in this way the sac is completely obliterated, and it is impossible for it to reinvert through the femoral ring.

In cases of inguinal hernia, he states, the method is applicable only when the sac is of small size, inasmuch as the entire sac must be pulled back into the abdominal cavity and the pillars of the internal ring sutured with mattress sutures, the same as in femoral hernia.

It is easy to believe that many small hernias can be cured by some such method as the above, but, for a hernia of any size, I believe it much better to make an external incision and perform a radical cure by the most approved methods.

Radical Cure of Hernia. Nassau,² of Philadelphia, discusses the radical cure of hernia, and bases his conclusions upon 133 operations (119 patients) performed at various hospitals in Philadelphia in recent years, 28 being for strangulated hernia, with 5 deaths. There was 1 case of partial suppuration requiring removal of a silk ligature; 1 case recurred in six months at the site of the transplanted cord. The number of cases traced is not stated.

Nassau states that for the last seven and one-half years, except in direct hernias and not always then, he has not transplanted the cord, unless demonstrating the typical Bassini operation to students. In all ordinary hernias in which there has been a well-defined sac, the inversion-transposition method of Kocher has been used. He advocates transplantation of the rectus muscle in cases of direct hernia, except in children.

Except in children aged under sixteen to seventeen years and in neurotic individuals, he strongly advocates local anesthesia.

As regards the transplantation of the cord, I believe that our experi-

¹ *Annals of Surgery*, April, 1912.

² *Ibid.*, June, 1912.

ence at the Hospital for Ruptured and Crippled has fully demonstrated the advantages of transplantation over non-transplantation. In 1892, at the Hospital for Ruptured and Crippled, Dr. Bull and myself began a series of cases in which the typical Bassini operation was done, with exception of the transplantation of the cord, and we stated that it was possible that this step was not necessary, but that fuller data were required before a definite opinion could be ventured. The procedure was described in the *Annals of Surgery*, May, 1893, and also in the *International Text-book of Surgery*, 1898, before it was published by Ferguson, of Chicago.

We have made a strong effort to determine the advantages or disadvantages of this operation as compared with the typical Bassini method in a table of 2768 cases of inguinal hernia in the male, operated upon at the Hospital for Ruptured and Crippled; the typical Bassini operation with transplantation of the cord was done in 2122 cases with 0.4 per cent. of relapses, while in the remaining 646 the cord was not transplanted, with 1.5 per cent. recurrences. The majority of these results have been in children, and while it may be admitted that in children the difference in proportion of radical cures is extremely slight, my own statistics in adults show a considerably larger number of recurrences in the cases in which the cord was not transplanted, than in those where it was. We still continue the step of transplanting the cord as a routine measure in our operations for inguinal hernia in the male.

Strangulated Hernia in Infancy. Collins,¹ of Duluth, Minn., discusses the question of strangulated hernia in early infancy. The paper is based upon a study of reported cases under the age of six months. He states that the youngest case on record is that of Woodbury's, operated upon by Andrews in 1874. The child was forty-five hours old when operated upon for strangulated right inguinal hernia, the hernia being the size of a child's head. The tumor contained the greater part of the large intestine. Operation was followed by complete recovery. White,² Stern and Burnier,³ each report a case operated upon at the age of eleven days.

The fifth case, in the order of age, was a case of mine reported in the *Medical Record*, March, 18, 1905. In this case, the child was thirteen days old and the hernia was strangulated fourteen hours. I did a Bassini operation which could be carried out without difficulty, and which was followed by a permanent cure. Collins reports 1 case, operated upon by himself, when the patient was eighteen days old. It was not planned to perform a radical cure in this case, but principally to save the child's life.

¹ *Annals of Surgery*, February, 1913.

² *Medical Record*, 1903, lxiv, 295.

³ *Bull. de la Soc. d'Obstet. de Paris*, 1907, x, 283.

Collins reports 112 cases operated upon up to the age of six months. Of these, 34 were one month, 27 two, 24 three, 12 four, 6 five, and 9 six months old.

As regards the *contents of the sac* the appendix and cecum were frequently found. It has been generally observed that the younger the patient, the more often is the large intestine, principally the cecum, found in the hernial sac. According to Stiles' statistics, the cecum was found in the hernial sac in 7 per cent. of the cases. In Telford's 104 cases, the small intestine was found in the sac in 83 cases, the cecum and appendix in 21.

Collins believes that the diagnosis presents few difficulties compared to the diagnosis in adults. An accurate history he regards as of utmost importance. The absence of stools, presence of pallor, and sunken eyes he considers as important symptoms. He speaks of an acute hydrocele simulating a strangulated hernia.

I have, on a number of occasions, called attention to the fact that a hydrocele of the cord in young infants has been frequently mistaken for a strangulated hernia. However, the history of the case, and the general appearance of the patient, will, in nearly every case, make it possible to render the differential diagnosis. As a rule, hydrocele of the cord does not come on so suddenly as a strangulated hernia; it is much more movable than strangulated hernia. The peculiar, tense, cystic "feel" on palpation may occasionally be mistaken for a distended sac of a hernia, especially if there has been considerable serous exudate about the small loop of bowel. However, the general appearance of the patient, the fact that there has been no stoppage of the movements of the bowels, and the absence of vomiting, should enable one to make the correct diagnosis.

As regards *prognosis*, Estor's statistics show a mortality of 23 per cent.; Dowd believes that it should not exceed 10 per cent. My own cases, observed at the Hospital for Ruptured and Crippled, 17 in number, showed no deaths.

Collins states that chloroform has been used in the majority of cases; in no case has it apparently been done under local anesthesia.

Personally, I regard ether as the preferable anesthetic.

The great majority of cases healed by primary union.

The relative frequency of strangulation in children to that in adults, has been variously estimated by different authors as 1 to 62, 1 to 107, and 1 to 108.

With reference to *treatment*, taxis is dangerous and should be seldom resorted to. Certainly no force should be used in carrying it out. If, after application of hot towels for a few moments and gentle manipulation, the rupture does not disappear, immediate operation should be performed.

I believe that the Bassini method, with transplantation of the cord,

is the best form of operation both for children and adults. In infants and younger children, I believe it does not matter very much whether the cord is transplanted or not. It can, however, be done with perfect ease, no matter how young the child.

Operation for Appendicitis and Inguinal Hernia. Voelcker¹ describes the following method of operation for appendicitis and inguinal hernia in one sitting, which he has successfully performed in 3 cases. The steps of the procedure are briefly as follows: The usual oblique skin incision parallel to Poupart's ligament, is lengthened to the anterior superior spine of the ilium; splitting of the exposed aponeurosis of the external oblique muscle from the external inguinal ring outward and upward, as in Bassini's operation is then done; this splitting is continued so as to include 3 to 4 cm. of the belly of the external



FIG. 29

oblique in the direction of its fibers. On taking apart the split aponeurosis and muscle, a large part of the internal oblique muscle will become apparent. After this it is an easy matter to separate the fibers of this muscle, as well as the fibers of the transverse muscle, to open the peritoneum and, after removing the appendix, to unite the peritoneum, transverse muscle, and internal oblique with a few sutures. In the median part of the wound the hernial sac, with the cord, will be seen to protrude from below the border of the internal oblique muscle. It is then easy to ligate the sac, and, after lifting the cord to suture the border of the internal oblique muscle to Poupart's ligament, according to Bassini; thereupon the aponeurosis of the external oblique, as well as the muscle itself is sutured, and the skin is closed.

¹ Beitr. z. klin. Chir., 1911, Band lxxii, Heft 3.

The above method of combining the hernia operation with the operation for the removal of the appendix at the same sitting is an admirable one, and I have myself performed it in a number of cases with complete satisfaction. It was described by Torék, of New York, several years ago, and was reviewed in *PROGRESSIVE MEDICINE*.

The Use of Silver Wire or Filigree Implantation in Hernia. Ever since the introduction of the method of filigree implantation—as originally described by Phelps, and later by Willy Meyer, Bartlett, Wiener—I have from time to time advised against its use, except in a very small and selected number of cases.

McGavin,¹ of the Seaman's Hospital in London, who has been one of the most earnest advocates of this method ever since its inception, in a recent article reports 146 cases treated by implantation; of these, 106 were inguinal and 40 umbilical or ventral; but, as 20 of the former were bilateral, the total implantations numbered 166. As regards the ages of the 146 cases, 11 were aged over sixty years, the two eldest being seventy-two and sixty-seven years respectively; 27 were between the ages of fifty and sixty years; 48 were between the ages of forty and fifty years; and the remainder were under the age of forty years. Thus, he states, 86 cases were beyond the age at which we usually regard the prospects of a cure as slight. Repeated attempts to cure by the usual methods had rendered the implantation of filigrees increasingly difficult, and the size of many of these herniæ which had been cured was a high testimonial to the efficacy of the method in question. He states that recurrence after implantation could only result from sepsis or faulty technique. He had had two cases of recurrence, one from each of these causes; both had been ultimately cured by fresh implantation. The only effect of suppuration in the case of abdominal filigrees was to render the abdominal wall even stronger than in the case of a primary union. No untoward results had been seen after implantation, the patients being, after a few weeks, quite unaware of the presence of the wires.

What happens to these filigrees of silver wire after they have remained a long time within the tissues, is a question which, up to the present time, has not been answered fully. That they occasionally cause sinuses long periods after operation, I have repeatedly known from cases observed at the Hospital for Ruptured and Crippled. Personally, I believe that there are very few of these so-called cases "incurable by other methods," that cannot be quite as satisfactorily repaired by some method of overlapping the normal structures, either muscle or fascia.

McGavin's² conclusions are as follows: "(1) Few hernias can now be called incurable. (2) Filigree implantation is the only true radical

¹ *Lancet*, December 21, 1912.

² McGavin does not state how long his cases were traced.

cure. (3) There is a slight increase in the danger of sepsis. (4) Suppuration is not an indication for the removal of filigrees. (5) Wires displaced into a sinus should be simply snipped out. (6) In appendicular hernia, the appendix, if still present, must first be removed. (7) No belt or truss should be applied on the top of an implanted filigree. (8) For the avoidance of ileus in large inguinal hernias, the Trendelenburg position should be used, laparotomy performed, and an endeavor made to withdraw the contents of the sac from within. (9) Implantation cannot be governed by the hide-bound rules as to shape, size, and position of filigrees. (10) The operations are often extremely difficult, tedious, and fraught with risk, and every care should be taken to minimize danger by perfect asepsis, a good light, and the help of spinal analgesia; they should not be attempted by those unskilled in major surgery."

In view of what I have stated above, I cannot, of course, agree with McGavin's second conclusion that, "Filigree implantation is the only true radical cure," nor can I subscribe to his fifth conclusion, that "wires displaced into a sinus should be simply snipped out." I have seen some cases in which, after removal of one wire after another, during which time the patient made frequent visits to the dispensary for treatment for a good part of the year—sinuses failed to heal until all the wire was removed, and by this time a hernia many times larger than the original one had developed, and a condition occurred which it was then no longer possible to cure by radical operation; nor could the rupture, in view of the large area of thin cicatricial tissue, be successfully controlled by a truss. In other words, the patient, aged fifty-five years, was rendered incapacitated for any sort of work for the rest of his life, and this was a case that could easily have been cured by an ordinary Bassini operation.

Hernial Predisposition and Traumatic Hernia. Zollinger¹ contributes some valuable data to the question of hernial predisposition and traumatic hernia. To show the contradictory views still held by the profession, as to the meaning and significance of a hernial predisposition, he cites the vastly differing average figures given by the various authors in regard to such predisposition. According to Schönwert, of 127,495 men only 8243, *i. e.*, 6.5 per cent. had a wide hernial opening. Schwiening, in his statistics covering 1,252,795 men drawn for military service, found a hernial predisposition in 197,416 (15.75 per cent.). Of 1000 workmen examined by Liniger, 40 per cent. had perfectly normal inguinal canals; 50 (3 per cent.) showed the signs of a hernial predisposition. Brandenburg found a hernial predisposition in 3051 out of 3807 men examined (80.2 per cent.).

Among the clinical conditions considered as predisposing factors by different authors are the following: Abnormal width of the external

¹ Deutsch. Zeitsch. f. Chir., February, 1912.

inguinal canal; straight and short course of the inguinal canal; weakness of the muscles and fascia; resistance to the finger introduced into the canal; inguinal testicle; varicocele.

Zollinger reports his findings in 4836 patients examined within one year, their ages ranging between sixteen and fifty-four years. 1407 of these, or 29 per cent., showed a narrow, firm, external, inguinal ring on both sides, not admitting the tip of the finger; 3104 showed symptoms of hernial predisposition, *i. e.*:

(a) A wide external inguinal ring, a wide canal straight in its course (Auprall), no protrusion in 2103 cases.

(b) A wide external inguinal ring, a wide inguinal canal straight in its course into which a pouch bulges on coughing, in 1001 cases; 224 of the men had an interstitial hernia; 97 an inguinal hernia.

He states that a wide external ring alone does not constitute a hernial predisposition as it is of no great importance for the primary development of a hernia.

According to the observations of Woskresensky, inguinal rings admitting two or three fingers are found in 20.3 per cent. of all healthy individuals. Jastschinsky, in his examinations of cadavers, observed such rings, 40 by 30 mm. in diameter in 3 per cent. of the cases without a hernia having developed. Benevoli, as early as 1746, reported a case in which the external inguinal ring was so large as to admit a fist and yet there was no hernia.

Zollinger's table shows the highest proportion of normal conditions as regards inguinal ring and inguinal canal among men from sixteen to nineteen years of age. With increasing age and continuous hard labor, the predisposition to hernia becomes greater. He found an inguinal hernia present in 97 (2 per cent.), and interstitial hernia in 228 (4 per cent.) of the cases.

It should be mentioned that patients with large hernias would not be likely to be found in his material, as it is known that the company does not accept such for work. He found reddened inguinal testicle in 56 cases; 20 of these were of unilateral undescended testicle.

As regards the *prognostic significance of so-called hernial predispositions*, Zollinger does not believe this to be very great. He states that in only 3 of the cases with hernial predisposition did hernia develop, and all of these were traceable to heavy lifting.

Among the patients without hernial predisposition, a true traumatic hernia occurred in a man, aged twenty-three years, as a result of severe abdominal contusion in a tunnel accident. Manual reduction of the hernia proved very difficult; both external rings were very narrow, not admitting the tip of the finger. At the upper border of the ring, a tear about 1 mm. in size could be palpated. After successful taxis, the hernia did not come down any more, even on coughing.

Zollinger states that true traumatic hernia, *i. e.*, such that have

developed in all parts as a result of a trauma, are exceedingly rare. Görtz believes that the proportion is not more than 1 in 10,000; Blazius found it 1 in 1000. Zollinger discusses the generally accepted signs of a true traumatic hernia, and states that the absence of a hernia at an examination just prior to the accident, which is usually considered definite proof of the traumatic origin of a hernia, does not, with absolute certainty, preclude the possibility of the existence of the hernia previous to the accident, as a very small hernia may escape the notice even of an experienced examiner.

A traumatic hernia must cause such pain as to force the patient to quit work immediately and call in a physician. The hernia must be small and free from adhesions and very sensitive, the external ring very narrow; and reduction very difficult and painful. In addition to these signs, there are the visible clinical traces of an injury. In many cases, the positive diagnosis can be made only upon operation.

The great increase in our knowledge of the etiology of hernia in recent years, should enable us, in the near future, to determine more definitely what we mean by hernial predisposition. A great and all-important predisposing factor in hernia is the presence of a preformed sac; yet, we are often unable to determine the presence or absence of such a sac except by operation. With the presence of such a sac, persons with splendidly developed abdominal walls, and inguinal rings apparently of normal size, may develop a hernia, and, in the absence of such a sac, persons in feeble health, with weak and flabby abdominal walls may go through life without the development of a hernia. Hence, I believe that the careful statistics that have been gathered by examinations of men applying for military service, showing the exact size of the inguinal canals, and inguinal rings, is of very little value in determining the percentage of cases with hernial predisposition. That this percentage depends largely upon the theoretical views entertained by the examiner is borne out by the fact that Liniger, who examined 1000 workmen, found a hernial predisposition in 50 per cent.; while Brandenburg, in 3807 examinations, found 80 per cent., or nearly twice as many.

An inguinal testicle I would not call a predisposing factor, inasmuch as maldescended testis is practically always associated with inguinal hernia.

I fully agree with Zollinger, that true traumatic herniæ, such that develop in all parts as the result of a trauma, are exceedingly rare. I believe that they occur only as the result of a sudden blow in the region of the inguinal canal by some sharp object, *e. g.*, the horn of a bull, or falling upon a picket, causing severe and easily recognized laceration of the structures of the canal.

The only other type of traumatic hernia would be that due to greatly increased abdominal pressure caused by falling against some object,

or some heavy object falling with violence upon the abdomen. It is, perhaps, to be questioned whether or not a hernia can be produced by any single increase in intra-abdominal pressure. Personally, I agree with Graser in von Bergmann's *Text-book of Surgery*, who states that a hernia in all its parts can never be the result of a single increase in intra-abdominal pressure, no matter how great. This is practically the opinion of McCready, the great English authority on hernia. This is a fact not appreciated by the laity, and it has apparently never been heard of by the legal profession representing the plaintiff. The idea that hernia is a disease, and not an accident, is slowly but steadily gaining ground.



FIG. 30.—Prevascular femoral hernia, before operation.

Prevascular Femoral Hernia. Moschcowitz¹ reports a case of prevascular femoral hernia, in a man, aged fifty years, which had existed for fifteen years, and, with exception of its bulk, had never caused him any inconvenience until five days prior to operation, when, after lifting a heavy weight, the hernia suddenly became irreducible and very painful. Examination showed, at the junction of the right thigh and abdomen, a large globular swelling about 10 inches long, imparting the sensation of fluctuation; it was tympanitic on percussion and gave

¹ *Annals of Surgery*, June, 1912.

only a doubtful impulse on coughing. The diagnosis of premuscular or prevascular femoral hernia was made, and operation performed on April, 14, 1911.

Moschcowitz briefly reviews the theoretical anatomical conditions of a prevascular hernia, and points out that the femoral ring in this case was oval, of a flattened shape, extending from Gimbernat's ligament up to about an inch to the outer side of the femoral artery, easily admitting four fingers, a condition never seen in ordinary femoral hernia in which, no matter how large the hernia the ring is usually small and round, and the fascial compartment to the outer side of the ring is so dense that not even the femoral vein, much less the artery, can be seen. Furthermore, he states that right after he had peeled off the infrapoupartian portion of the sac, he was able to demonstrate



FIG. 31.—Prevascular femoral hernia, after operation.

to various visitors a perfect anatomical exposure of at least 5 inches of the femoral artery and vein which showed not the slightest trace of a covering. This he considers an absolute and incontrovertible proof that it was a prevascular femoral hernia.

Moschcowitz states that prevascular femoral hernia is extremely rare, and, omitting two cases of Stanley's¹ found in the cadaver, he believes his own case to be the third. Narrath² publishes 6 cases (2 bilateral) of prevascular femoral hernia after the bloodless reduction of 65 congenitally dislocated hips. These hernia, however, were of traumatic origin.

I have already given a review of Narrath's cases in *PROGRESSIVE MEDICINE*, June, 1900.

¹ Teale, *A Practical Treatise on Hernia*, London, 1846.

² *Arch. f. klin. Chir.*, vol. lix, p. 396.

Personally, I do not believe the condition nearly so rare as we are led to believe from the literature of the case. I believe that many cases are operated upon, but the difference from the ordinary type of femoral hernia is so slight, that it is either unrecognized, or thought of too little importance to warrant a special report. I have operated upon a number of such cases myself.

Cure of Femoral Hernia in the Aged. Paul M. Pilcher¹ discusses the cure of femoral hernia in the aged. He states that it has been observed that the simpler methods of closing the femoral canal, which are usually sufficient to bring about a cure in the aged, are not so universally successful in younger subjects, and that, on this account, so many operations (numbering in the neighborhood of 75) have been devised for the relief of femoral hernia. He states that in the majority of cases of femoral hernia in the aged, the condition passes unnoticed until some accident occurs which gives rise to pain or intestinal obstruction. He believes that, in addition to the age and general feebleness of these patients, the existence of chronic degenerative changes in the kidneys furnishes a strong contraindication to general anesthesia, which weakens and increases the rapidity of the heart action, irritates the lung tissue as well as the kidneys, and involves the serious risk of inspiratory pneumonia. All of these dangers, he states, can be avoided by the use of local anesthesia. Using a minimum amount of cocaine, the operation can be performed without pain to the patient and with practically no shock.

To obtain a sterile solution of cocaine, he heats an ounce of saline solution or water to 212° F., and drops one grain of cocaine into the solution. Then, having prepared the field of operation, the line of incision is infiltrated with the solution, the needle being passed into, not under, the skin so that the injection is intracutaneous and not subcutaneous; the effect will be to raise a weal. Pilcher prefers the vertical incision, beginning one inch above Poupart's ligament and carrying it down as far as necessary over the hernial tumor. The skin and subcutaneous tissues are divided, the sac is separated gently from the surrounding tissues and freed as far as the femoral opening beneath Poupart's ligament. Pilcher advises anchoring the sac high up by means of a suture introduced as shown in the accompanying cut. He closes the canal by means of a single purse-string suture of silk or chromic gut; the needle is first passed through Poupart's ligament near its attachment to the pubic spine; Gimbernat's ligament and the periosteum of the pubic bone are next included; the suture passes through the pectineal fascia and muscle, is carried across to include the sheath of the femoral vessels, and emerges again through Poupart's ligament.

This is practically the purse-string suture method which I have

¹ *Annals of Surgery*, May, 1911, p. 676.

advocated¹ for many years and have described on numerous occasions. Personally, I make no attempt to include the periosteum of the pubic bone, and do not believe it necessary. If the sac is completely freed, the stump ligated high up and pushed well into the femoral canal, there is no longer a funicular process; and, if the canal is enclosed in the suture, in my own experience, a radical cure is almost certain to occur. At the Hospital for Ruptured and Crippled we have had but 3 relapses in 156 cases of femoral hernia operated upon between December, 1891, and January, 1913.

I am in entire accord with Pilcher in advocating the use of local anesthesia in strangulated hernia in the aged, especially if complicated with serious disease of the lungs or kidneys.

Crural Hernia. In his article on "A Procedure for the Radical Cure of Crural Hernia," Kummer² states, "It is interesting to note from Guleke's *Surgical Impressions*, gained during his North American trip, that in that country experienced men, such as William Mayo and Oschner, when it comes to crural hernia, believe the less done the more favorable the result." Yet, he goes on to say, "it must be admitted that no method which leaves out the step of closing the crural canal can be considered as rational."

In speaking of Bassini's method of operation for crural hernia, the chief feature of which is the closure by suture of the crural "funnel," so termed by Bassini, Kummer states that there is a second crural funnel not mentioned by Bassini, situated *above* Poupart's ligament, which forms the abdominal entrance to the crural canal; the two funnels touching at the crural septum. It is this second funnel which is not closed by the Bassini operation. The latter, therefore, cannot be considered anatomically correct. To use the words of W. H. Bennet: "No plan for dealing with the aperture through which a femoral hernia comes, will be found to be permanently good, which does not include the essential detail of placing a barrier across the upper aspect of the femoral ring."

After reviewing the advantages and disadvantages of the various methods in vogue, many of which have been tried at the Ghent University, he recommends the following procedure which he terms "his own method of operation," and which, he says, enables the operator to obtain complete closure of the crural canal without causing any of the so-called secondary injuries produced by other methods. It consists, briefly, in the following: Opening of the sac after freeing it high up above the neck; loosening of any internal adhesions that may be present, high ligation of the sac which then retracts upward and has a tendency to form a spur; introduction of the finger into the crural canal and gently pushing it upward between Gimbernat's ligament and the

¹ International Text-book of Surgery, Warren and Gould, 1898. Keen's Surgery.

² Kocher's Festschrift, Deutsch. Zeitsch. f. Chir., 1912, Band cxvi.

femoral vein; thereupon the needle is introduced above the inguinal canal and passed through the fascia of the external oblique muscle, the musculature of the internal oblique, and the transverse muscle. After the needle has been passed underneath Cooper's ligament, it is directed outward through the crural canal toward the crural triangle. About 1.5 cm. inward and slightly above the first stitch-hole, the needle is again made to pierce the abdominal wall above the inguinal canal and pushed toward the thigh. The lowest end of the previously placed thread is now passed into the eye of the needle, and, with it, pulled upward. The two ends are then tied on top of the oblique fascia. Thus complete closure of the upper crural funnel from a point near the femoral vein to Gimbernat's ligament is effected by a single suture. Coarse double silk is used as suture material.

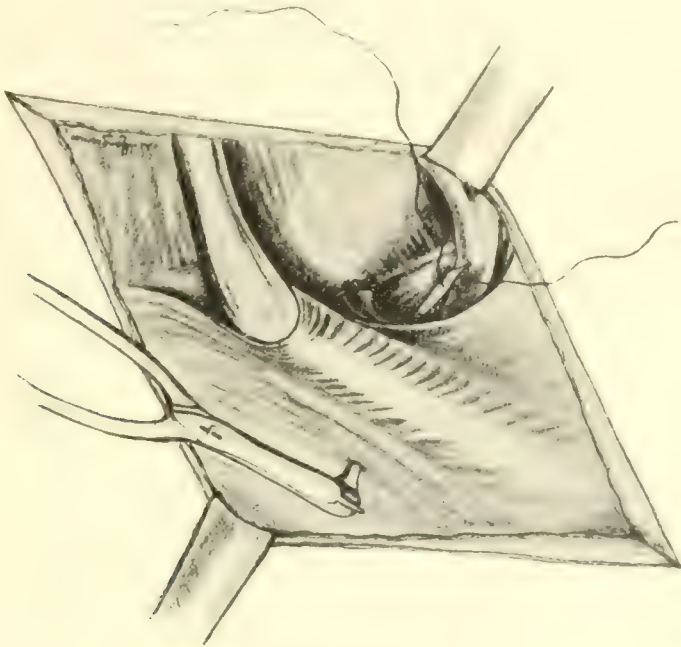


FIG. 32

The operation has been performed 23 times, in 21 patients since the beginning of 1907. There has been but one recurrence, and this was due to the use of silver wire, which has since been discarded. The second operation has effected a cure of the relapse.

As would appear from his description, the method is practically the same as that used by me for the last twenty years, and which I have described in the *International Text-book of Surgery*, Warren and Gould, 1898; *Keen's Surgery*, 1908; and *Annals of Surgery*, October, 1906. The only point of difference seems to be that he places the suture a little higher up the canal, nearer the internal abdominal opening, and that he uses silk instead of kangaroo tendon (see accompanying cuts).

That it is unnecessary to place the suture any higher than I have advised, is proved by our own statistics, at the Hospital for Ruptured

and Crippled, showing but three relapses in a series of 156 cases. I operated upon nearly 200 cases with only one relapse.

At the same time I must take occasion to condemn the use of coarse double silk, or any other non-absorbable suture, in operations for the radical cure of hernia, be it inguinal or femoral. Less than a year ago

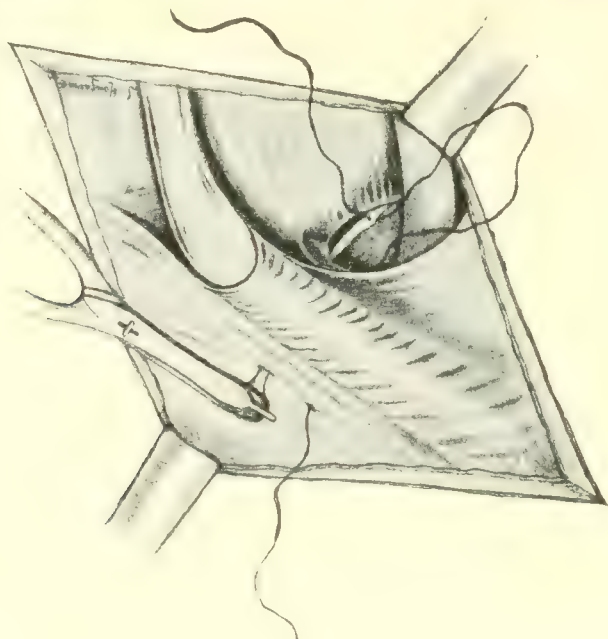


FIG. 33

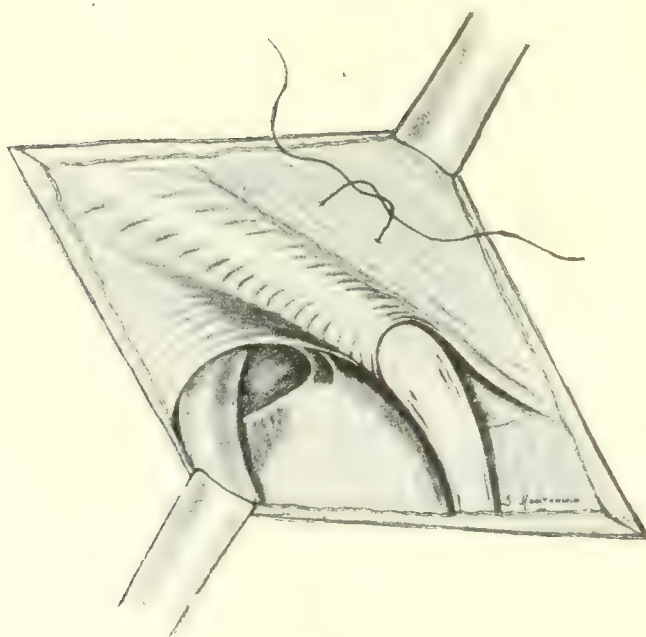


FIG. 34

I was called to operate upon 2 cases of persistent sinus at the site of a cicatrix after a hernia operation; I removed knots of coarse double silk which had been introduced at leading German Clinics nearly a year before. In both cases, the patients were young adults with small hernias which could have been easily cured had absorbable sutures been employed.

Appendix in Inguinal Hernia. Charles M. Remsen,¹ of Atlanta, Ga., reports a case of appendicitis in an infant aged sixteen days, with appendix in an inguinal hernia. The patient, a boy, was admitted to the Johns Hopkins Hospital on May 21, 1911. Four days previously he had begun to vomit every two or three minutes for two days; stools became lumpy and red, and the child seemed to be in great pain. A lump was noticed in the inguinal region which was extremely tender on palpation. Upon careful examination, a swelling was found to protrude from the right external ring, filling it completely and extending well down to the lower limits of the scrotum, surrounding the testicle and cord so that it was impossible to palpate these. There was a definite constriction about one-third the distance from the ring, which seemed to divide the swelling into two parts. The lower part was semifluctuant and seemed to be tender. Higher up, above the constriction, palpation gave the sensation of fluid under tension, and there was increased tenderness. Immediate operation was decided upon, and the condition above indicated was found. The patient made an uneventful recovery. Remsen states:

"It is interesting to note the lack of any special tenderness or muscular rigidity or spasm in the right iliac fossa and the presence of blood in the stools in this case. In association with this, the lack of any masses suggesting intussusception and local signs practically limited to the right inguinal canal and along the cord to the scrotum, the persistent vomiting, with the absence, however, of any peristalsis or distention, helped to make somewhat more difficult the unravelling of this condition. The general condition spoke against obstruction—at least against complete obstruction—yet appendicitis was not so strongly considered, even though the presence of an appendix in a hernial sac, either femoral or inguinal, is of course not a very rare occurrence. Most definite of all were the local signs, and it was here that we were misled into concurring with the diagnosis made on the outside, which was corrected only at the operating table.

"Signs and symptoms corresponded when the true nature of the condition was exposed, and not less interesting than the condition and position of the appendix was the complication of blood in the stools—this in all probability being an example of one of the rare cases in which such a sign is associated with an acutely inflamed appendix."

At the Hospital for Ruptured and Crippled we found the appendix in a considerable number of cases in hernia in children, but in no case has it been in the acute stage of inflammation at the time of operation. In a certain proportion of cases we have been able to make the diagnosis by palpation before operation.

¹ *Annals of Surgery*, December, 1912.

Inguinoproperitoneal, Interparietal, and Inguinosuperficial Hernias.
 Ehler¹ contributes some interesting data on the *etiology* of inguino-

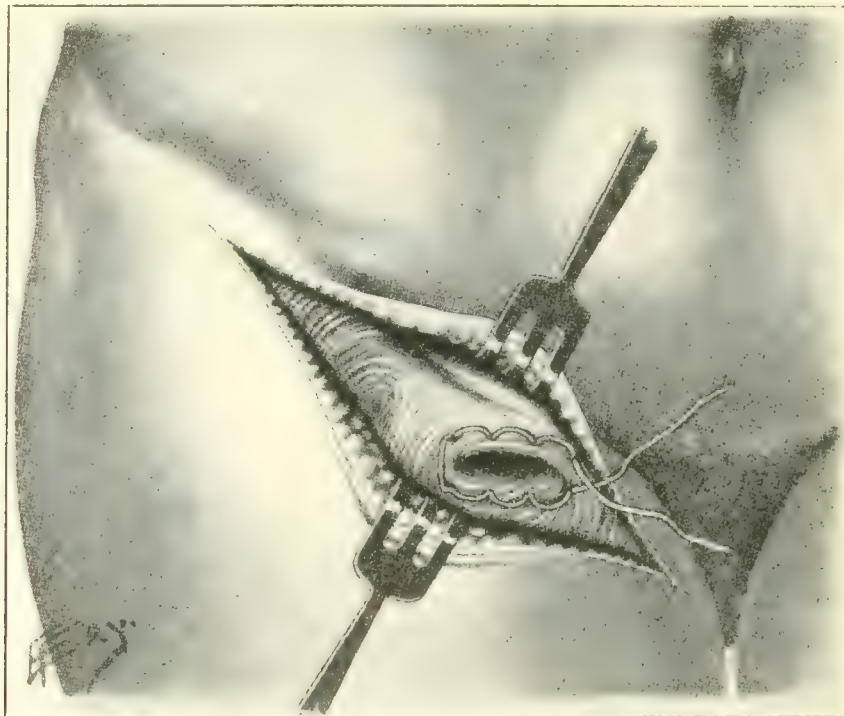


FIG. 35.—Coley's method.

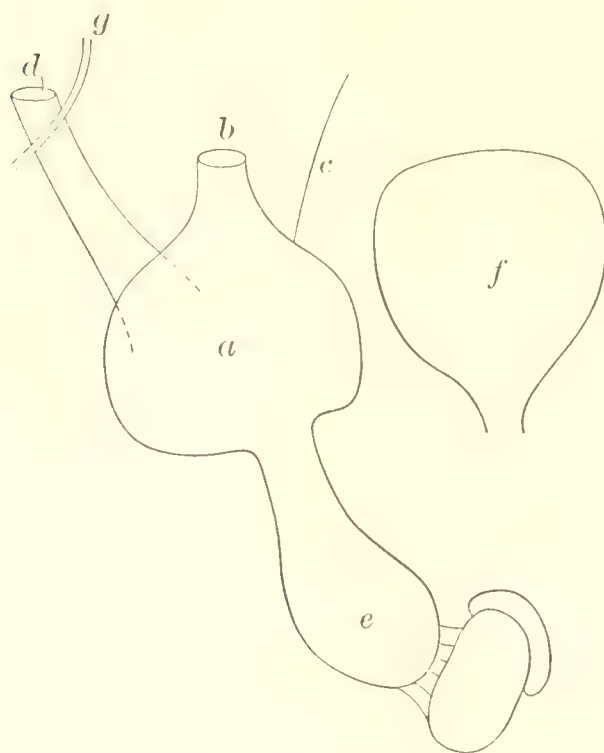


FIG. 36.—Inguinoperitoneal hernia. *a*, properitoneal recess; *b*, abdominal ostium; *c*, lateral umbilical recess; *d*, the internal inguinal hernia; *e*, scrotal recess; *f*, bladder; *g*, inferior epigastric artery.

¹ Arch. f. klin. Chir., 1911, Band xevi, Heft 4.

properitoneal, interparietal, and inguinoperitoneal herniae. He thinks that the dislocation of the internal ring, so frequently seen in these cases, probably represents the most important factor in the etiology of these rare types of inguinal hernia, especially those that are of congenital origin. In the interparietal variety, the internal inguinal ring is found upward and outward; in the inguinoperitoneal type, it is located downward and inward; in the properitoneal hernia, it usually remains at the normal site. He states that within the last six years he has operated upon several cases of interparietal hernia, and that his findings in these cases differ greatly from the hitherto accepted views regarding these hernias.

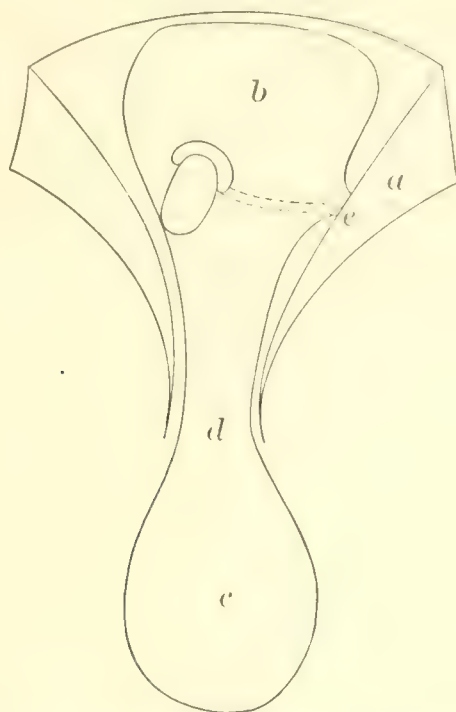


FIG. 37.—Interparietal hernia. *a*, the split external aponeurosis; *b*, the interparietal recess; *c*, scrotal recess; *d*, external inguinal ring, *e*, internal inguinal ring.

He reports one case of inguinoperitoneal hernia, in a man, aged forty-eight years, who had worn a truss only for a few months. The week before he entered the clinic, he was suddenly taken ill with severe abdominal pain followed by vomiting and total retention of stools. Operation showed two communicating hernial sacs, one of which was a typical properitoneal sac, the other had passed through the external ring and descended into the scrotum. Each of these diverticuli had its own entrance.

He further reports a case of interparietal hernia (Fig. 37), and on the basis of his findings in this and other cases, expresses the conviction that the insertion of the gubernaculum hunteri and the development of the vaginal process as also other organs of the human body may show congenital abnormalities. These abnormalities refer either to

the place of passage through the abdominal wall or the direction of such passage, or there may be doubling of the processus vaginalis, etc.

Ehler states that there are evidently numerous etiological factors that could theoretically explain the development of interparietal herniæ; whether or not these factors *actually* help to bring about these herniæ has not been proved. By far the greater number of interparietal herniæ are of congenital origin, due probably to the dislocation of the internal inguinal ring.

As regards inguinosuperficial herniæ, Ehler states that only about 50 have been so far reported in the literature. He has operated upon 3 such cases within the last six years. In his cases, however, the anatomical findings were quite different from the normal type described by Küster, as may be seen by a study of his cases.

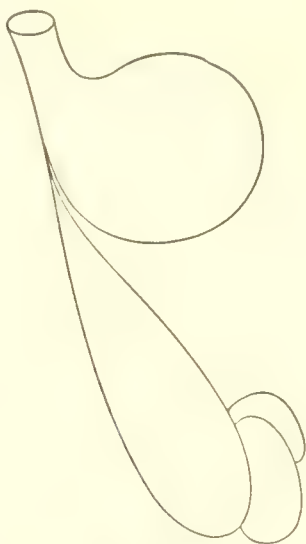


FIG. 38

CASE I.—Acquired inguinosuperficial hernia; male, aged thirty-two years. Has worn a truss for ten years. Operation, February 22, 1908. Upon incision of the skin, a hernial sac immediately appeared. On preparation of same, a diverticulum reaching down to the normal scrotum is found. This was connected with the upper diverticulum by a band. The upper recess was situated subcutaneously and in the direction of the bladder. The external inguinal ring admitted the tip of the finger; the inguinal canal was of normal length; radical operation; cure; free from relapse two and one-half years later (Fig. 38).

CASE II.—Male, aged eighteen years. Never had any symptoms of hernia. Five weeks ago sudden onset of colicky pain. Small swelling was noticed in the right groin. Operation, November 26, 1909. On preparation of the sac, it was seen that, from the original sac, a narrow recess descended into the scrotum. The same was firmly adherent to the cord. Another recess was found underneath the skin near the

external inguinal ring. After ligation of the sac, it was seen that it had a double neck which can be traced to the subcutaneous recess, where it entered into the lower diverticulum. Radical operation; cure.

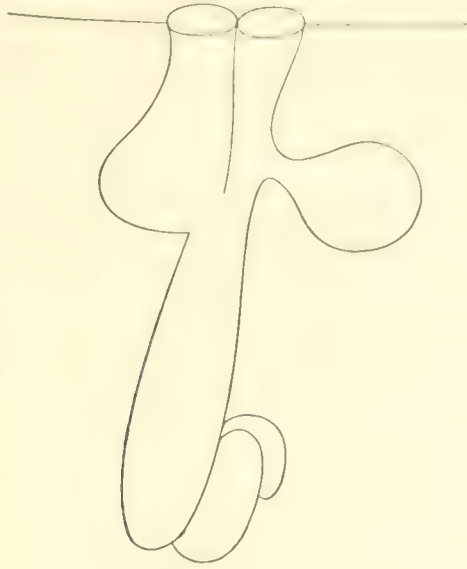


FIG. 39

CASE III.—Male, aged nineteen years. Never wore a truss. Operation June 16, 1910, showed a congenital testicle hernia. The testicle was situated in the lowest fundus of the sac, and was normal in appearance. The crural recess extended directly underneath the skin and was tightly adherent to its foundation. The neck of the sac was rather long and there was a constriction near the internal inguinal

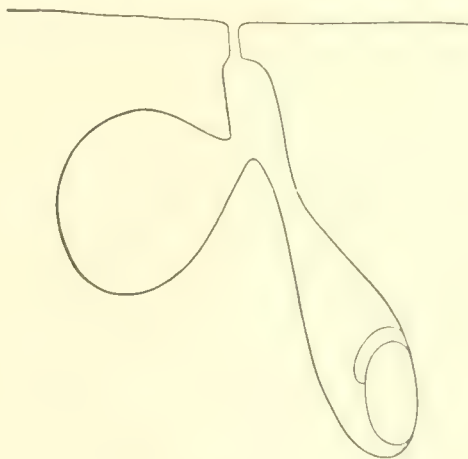


FIG. 40

ring. Both recesses were connected by a narrow opening and contained only serous fluid; hence, this case really represented a hydrocele after obliteration of the neck of the hernial sac (Fig. 40).

Ehler's conclusions regarding inguinosuperficial herniæ are: (1) These herniæ are usually of congenital origin, although they may be acquired. (2) They do not always show anomalies in the position

and development of the scrotum. The inguinal canal and inguinal rings may have a normal appearance. (3) The superficial recess in these herniæ may develop also inwardly.

Ehler, with most observers, greatly overestimates the rarity of *inguinosuperficial herniæ*. He states that only about 50 cases have been reported in the literature. At the Hospital for Ruptured and Crippled, we have had 55 cases within the last twenty years. In addition to this, I have operated upon at least 50 cases in adults outside of the Hospital.

I do not believe the dislocation of the internal ring plays any role in the origin of interparietal hernia, or, if it does, a very unimportant one. I believe all types of interparietal hernia to be due to a congenital abnormality in the sac or parietal peritoneum. According to the position of these congenital pouches—in the perineum, beneath the aponeurosis of the external oblique, or wherever else—there arise the different types of interparietal hernias, and not because the testicle follows any line of least resistance, or is drawn into abnormal position by abnormally developed fibers of the gubernaculum.

Perineal Hernia. Alfred Exner,¹ of Hochenegg's Clinic, reports a case of perineal hernia in which he did a plastic operation, making use of the gluteus maximus, as devised by Tandler and Halban (Fig. 41).

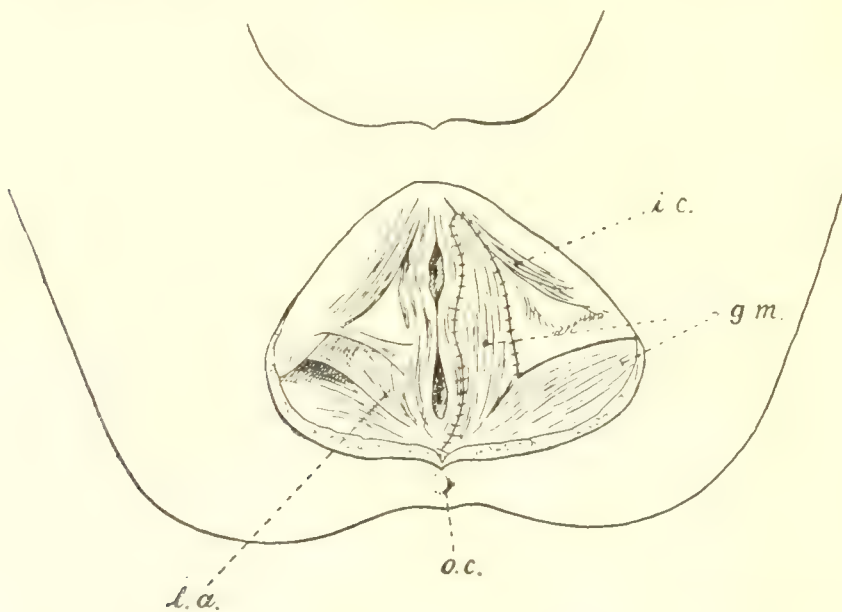


FIG. 41.—*i.c.*, musc. ischiocavernosus; *g.m.*, musc. gluteus maximus; *l.a.*, musc. levator ani; *o.c.*, os coccygis.

The patient was a woman, aged thirty-six years, unmarried, who ascribed the trouble to a fall while skating two years ago. The operation was done on November 30, 1911, and on reëxamination, end of March, 1912, the finger introduced into the vagina could distinctly

¹ Arch. f. klin. Chir., 1912, Band xxviii, Heft 4.

palpate a well-contracted muscle mass represented by the transplanted maximus muscle, which had affected complete closure of the hernial opening.

In referring to the therapy of perineal hernia, Exner does not believe that a radical cure can be obtained in these cases by a simple ligature of the sac with layer suture of its coverings. It is also essential that a new muscular base of perineum be supplied, and, for this purpose, he considers the procedure above referred to most effective.

Exner, in his extensive work on the subject, concluded that the following three factors are of decisive importance as regards the development of a perineal hernia:

1. The behavior of the peritoneum within the small pelvis.
2. Consistence of the levator ani.
3. Length of the mesenterium of the small intestine.

His studies upon the cadaver and upon embryos show that the distance between the floor of the pelvis and the ischiorectal cavity in Douglas is so marked, also laterally to the bladder, that the development of a perineal hernia is hardly to be conceived of under normal conditions. Exner's conclusions on the basis of these investigations are as follows:

1. Perineal herniæ imply a congenital predisposition.
2. A trauma alone is not capable of causing such a hernia.
3. The cavity between bladder and rectum (or between rectum and uterus) is deeper and more pronounced in the embryo than in later life. In the event of this cavity's persisting, the conditions favorable to the formation of a hernia are given.
4. The depth of this cavity is not always the same in embryos of the same age.
5. The descent of the hernial contents in the upper portion takes its course toward the median line. Not until it has descended some distance does a lateral deviation occur.
6. A perineal hernia passes principally through two definite fissures situated between the muscle levator and ischiococcygeus, or between the ischiococcygeus and coccygeus.
7. The presence of these fissures has been frequently proved in man.
8. All herniæ that appear at the lower aperture of the pelvis represent different varieties of but one type of hernia.
9. Perineal herniæ in the dog are merely protrusions of the rectum through the wide fissures in the levator ani, without a sac.
10. This type of hernia occurs also in man, and may be the result of habitual constipation.

While a number of authors have tried to prove congenital anomalies to be the principal cause of perineal hernia, the observations of others have shown that the relation between the development of a perineal hernia and the simultaneous appearance of a tumor cannot be ignored.

Paraperitoneal Bladder Hernia. Süssenguth¹ reports one of the extremely rare cases of incarcerated true paraperitoneal bladder hernia, in a man, aged thirty-three years. The hernial sac had come down through the fovea inguinalis medialis as a direct hernia, and was found somewhat above and lateral to the cystocele that had developed through the same hernial opening. The bladder prolapse was associated with a fatty tumor situated in front of the external ring, showing all signs of incarceration. The bladder was unintentionally injured during the operation, causing a temporary fistula. The patient died of an intercurrent disease thirty days after operation. A positive diagnosis was not made before operation. The symptoms pointed to incarceration of the gut rather than of the bladder, especially as the bladder symptoms present could be easily referred to the likewise present hypertrophy of the prostate.

Süssenguth states that he has found but 7 cases of incarcerated true paraperitoneal cystocele. Only in 2 cases (women) was the trouble associated with a crural hernia. In the other cases (all men), an inguinal hernia was present.

Süssenguth's case emphasizes the importance of exercising care in dissecting out a hernial sac in the direct type of hernia, especially in the presence of a so-called fatty tumor in close relationship with the sac. In nearly all cases of direct hernia, especially in adults with considerable adipose tissue, one is apt to find this so-called fatty tumor extraperitoneal to the sac. It should always be regarded as a warning signal of the near presence of the bladder. By heeding this danger signal, I have avoided, thus far, ever opening the bladder.

Treitz's Hernia. Maschke² describes a case of Treitz's hernia observed in Madelung's Clinic in May, 1909. The patient gave a history of having suffered from cramps in the bladder region for the last ten years, the attacks usually occurring at night, independently of urination. On April 25, 1909, he was taken with severe pain in both sides of the abdomen. On the following day this became localized in the lower right side; no vomiting; stools had always been normal. Physical examination, on admission to the clinic, showed the abdomen soft and not sensitive. In the region of McBurney's point, a movable tumor about the size of a walnut could be palpated; the same was not painful on pressure. Incision parallel with the rectus muscle showed the tumor to be the greatly distended end of the vermiform appendix, which latter was tightly embedded in the cecum by numerous adhesions. Extirpation of the appendix and, after placing a drain, closure of the wound by suture. The patient's condition on the first day following the operation was good; no fever; movement after glycerin injection; removal of the drain on the fourth day. On the seventh day, sudden

¹ Deutsch. Zeitsch. f. Chir., April, 1912.

² Ibid.

severe abdominal pain, which increased. The abdomen was greatly distended; massive bloody vomiting occurred; death on the evening of the same day. Autopsy showed a Treitz hernia incarcerated within the hernial opening (Fig. 42).

Maschke states that, on reviewing the literature, he has been able to find but one similar case, namely, that of Bingel. Five months after the above observation, Maschke, while dissecting the cadaver of a woman, aged sixty-three years, accidentally found a Treitz hernia (Fig. 43). The patient had died under the clinical symptoms of heart

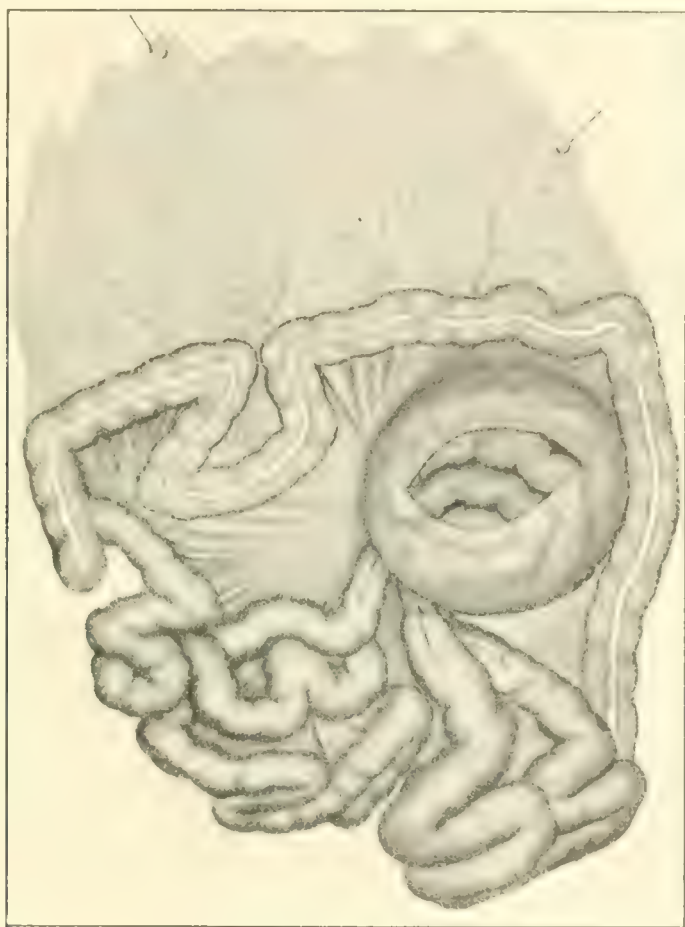


FIG. 42

failure. She had never been seriously ill, and no symptoms pointing to pathological changes in the intestinal tract had ever been noted. Maschke states that he has been able to collect, in all, 81 cases of Treitz's hernia, by far the greater number of which had been found accidentally on autopsy. In but 19 cases had any clinical symptoms been observed. The ages of the patients varied from two months to eighty years.

Of 75 cases in which the sex was stated, 51 were males and 24 females.

In regard to the clinical diagnosis of duodenojejunal hernia, Maschke does not believe that the same can be definitely made without operation.

Of the 19 cases that had shown clinical symptoms, 5 died without operation. Among the remaining 14 is the doubtful case of Sonnenburg, and one case of Rüping, in which laparotomy was performed on the basis of the diagnosis of ovarian cyst, but the hernia was not operated upon; 8 of the 12 cases operated upon were cured; 4 died.

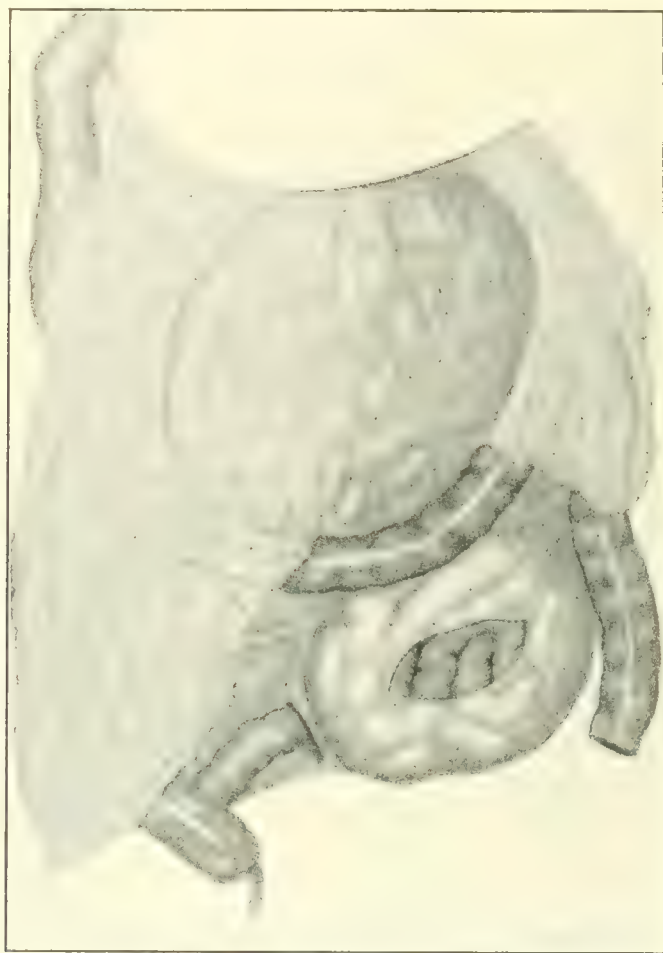


FIG. 43

In the same issue of the *Deutsch. Zeitsch. f. Chir.* (April, 1912) we find an autopsy report by Priebatsch, of a case of Treitz's hernia, with double incarceration, in a child aged two years, which the writer believes to be unique. Death had occurred under symptoms of peritonitis of a few hours' duration. Figs. 42 and 43 will show the condition found. It will be seen that the incarceration took place not, as is usually seen, at or through the neck of the sac, but outside and entirely independent of the same as the direct result of a strangulating loop of intestine.

Priebatsch states that the whole process has become possible only through the abnormal position of the cecum. He believes it must be assumed that the Treitz hernia with the same contents as shown on

autopsy, but without necrotic loops of intestine, existed for some time, without causing any clinical symptoms. For some reason or other the cecum was then, owing to its abnormal motility, turned upward, and therewith, the ileum-end attached to it, and fixated within the sac, was turned upward in such a way as to strangulate the upper section of gut and become kinked at the border of the hernial opening. Only in the presence of such abnormal motility of the cecum, combined with the abnormal depth of the duodenojejunal recess—both congenital defects—could the complicated conditions herewith shown arise.

SURGERY OF THE ABDOMEN. EXCLUSIVE OF HERNIA

By JOHN C. A. GERSTER, M.D.

Laparotomy under Paravertebral Anesthesia. Kappis¹ recommends injecting 5 c.c. of 1.25 to 1.5 per cent. novocain-adrenalin solution into the root of each nerve as it emerges from the intervertebral foramen. The lower six dorsal and upper three lumbar nerves must be blocked by this method to insure anesthesia of the peritoneum. For operations on the kidney, it is sufficient to block from the eighth dorsal downward.

The entire central nervous system is benumbed by administration of veronal the night before, and by injection of morphine and scopolamine three-fourths of an hour previous to operation. Anesthesia comes on ten or fifteen minutes after the paravertebral injection, and lasts an hour and one-half. Alcohol injection by the same method may be useful in gastric crises and abdominal neuralgias.

About the same time as the paper by Kappis, an article by Finsterer² appeared in which he reported employing a similar method in 6 cases. His first 2 attempts were failures; the other 4 were successful. The details of his method are as follows: With the patient lying in the lateral position, a needle, with centimeter marks, is inserted at a point 3 to 3.5 cm. lateral to the spine of the vertebra, and is then thrust directly inward 4 or 5 cm.; at this depth it should impinge upon the transverse process. The upper margin of this is sought by the needle point, which is then pushed 0.5 to 1 cm. deeper upward and inward; 5 c.c. of a 1 per cent. novocain solution are injected fan-wise. The lower dorsal and upper lumbar nerves are blocked in this manner. As the skin is supplied by thoracic nerves, it is not anesthetized, and hence a 0.5 per cent. novocain solution is injected locally before making the skin incision. As just said, anesthesia begins about fifteen minutes after injection.

The first of the 4 successful cases was one of diffuse peritonitis. Manipulation of the sigmoid was painless, but handling of the small intestine was painful. The second case was an ileocolostomy. The roots of the eleventh and twelfth dorsal, first and second lumbar

¹ Münch. med. Woch., 1912, No. 15.

² Zentralbl. f. Chir., 1912, No. 18.

nerves were blocked. There was no pain. The third case was more complicated, there was a tuberculous fistula of the cecum. Opening of the abdomen, freeing of adhesions at the splenic flexure, and division of the mesocolon, were absolutely painless. The same nerve roots were blocked as in the second case. In the last case the appendix was densely adherent to the cecum and posterior parietal peritoneum. The twelfth dorsal, first and second lumbar nerves had been blocked; there was absolutely no pain.

The advantages claimed for this method are that it is safer and lasts longer than spinal anesthesia; however, the technique is more difficult. Finsterer does not recommend this as a routine procedure. It is useful in patients having pulmonary conditions contraindicating general anesthesia. It is especially suitable where very exhausted individuals are to undergo extirpation of tumors of the cecum or sigmoid.

The Size of Abdominal Incisions. The day of the button-hole incision for chronic appendicitis is over. For the past twenty-five years certain surgeons have preached the value of performing laparotomy under the "guidance of the eye," while others have adhered to the "inch and one-half, minute and a half, week and a half" principle. The former course is now recognized as the correct one. However, this does not mean making an unduly large wound, but merely one sufficient to see what is being done in the depths.

The frequency of coexisting intra-abdominal lesions has been pointed out by those leaders in surgery who obtained their knowledge through using incisions of adequate size. Practically every article upon intestinal stasis, cecum movile, or membranous pericolicitis, contains the recommendation of incisions which permit proper inspection of the surrounding viscera. The advantage of exploring the abdomen whenever this is feasible will be referred to later.

Transverse Abdominal Incisions. Sprengel,¹ the foremost advocate of transverse abdominal incisions, recommends the following technique as an aid in overcoming retraction of a wound where both recti have been divided:

A firm mattress suture unites the upper and lower margins of the incision at its centre, thus reestablishing the linea alba (Fig. 44); this suture also includes the round ligament of the liver. A single hook, inserted into the outer angle of the peritoneal wound, brings the peritoneal margins (posterior sheath of rectus) more clearly to view; they are then united. Three mattress sutures are passed through the muscle and its anterior sheath (Fig. 45); these are not knotted, but are pulled upon (acting as tension sutures) until the margins of the cut aponeurosis approach each other, when these edges are united, then the mattress sutures are finally tied (Fig. 46).

¹ Zentralbl. f. Chir., 1912, No. 24, p. 809.

König¹ and others report satisfactory results with transverse incisions in operations on the bile passages.

For the past two years Perthes² has used a method which anticipates the retraction of the recti by anchoring them to their anterior sheath.

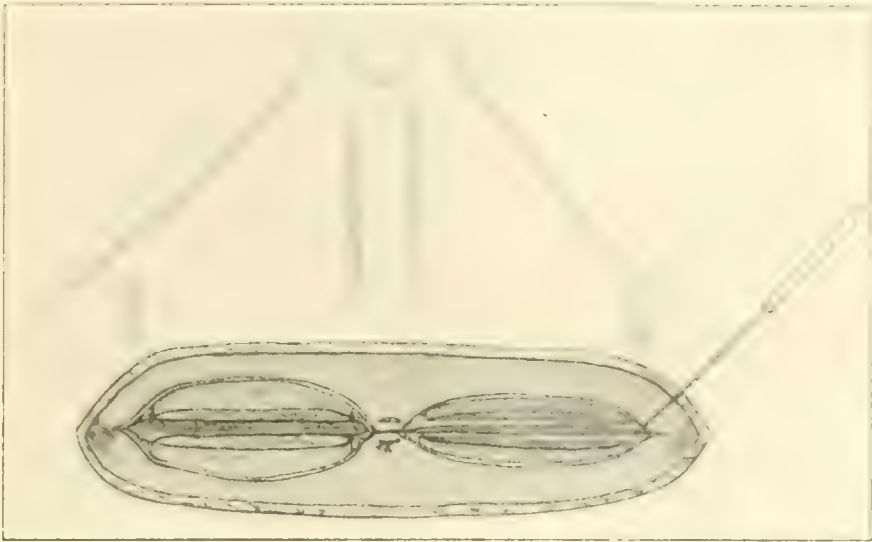


FIG. 44.—Repair of transverse abdominal wound. Mattress suture has approximated margin of the wound at its centre. (Sprengel.)

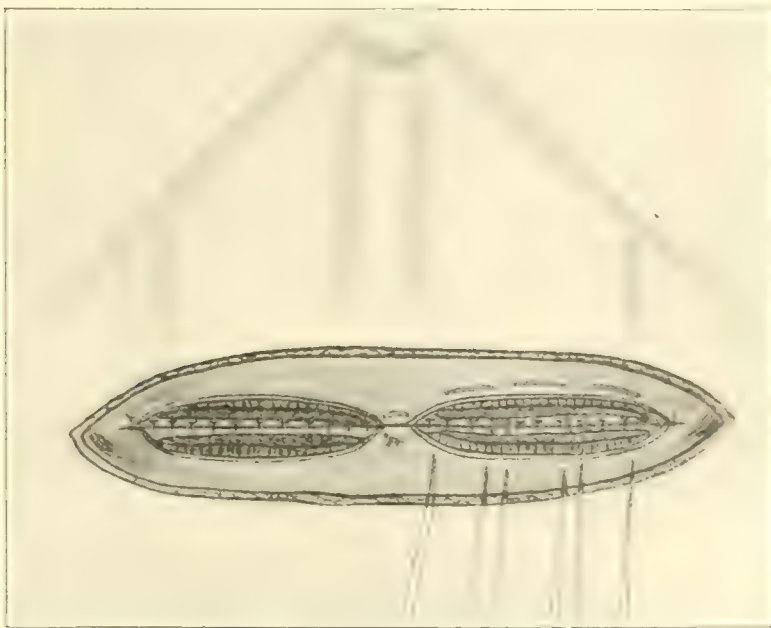


FIG. 45.—Peritoneum (posterior rectus sheath) united. Tension mattress sutures passed on one side. (Sprengel.)

This is accomplished as follows: After the skin incision is made, exposing the anterior sheaths of the recti, the peritoneal cavity is opened by a small, transverse incision in the median line, through this the operator's left index finger is inserted, and acts as a guide in

¹ Zentralbl. f. Chir., 1912, p. 529.

² Ibid., No. 37.

correctly passing the double row of mattress sutures. The needle should not enter the peritoneal cavity. Usually three upper and three lower sutures are sufficient for each rectus; the rows should be at least 1 cm.

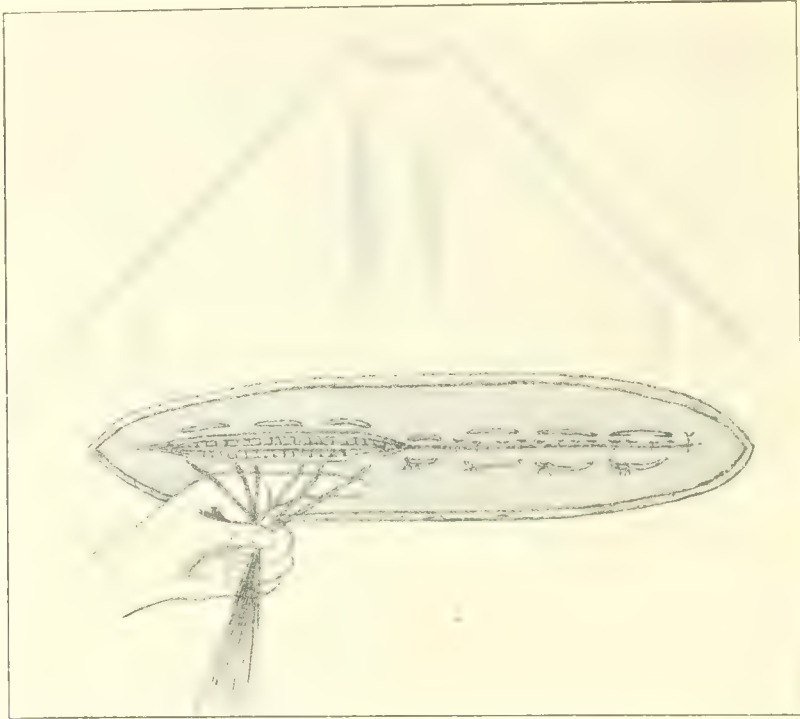


FIG. 46.—Tension sutures passed, approximating anterior sheaths of recti. One-half of wound closed, tension and approximating sutures tied. (Sprengel.)

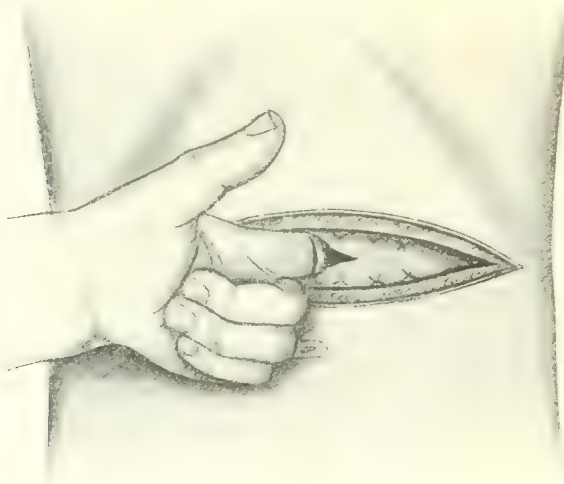


FIG. 47.—Retraction of recti prevented by passing mattress sutures before incision. Left index inserted through small median incision acts as guide in passing of sutures. (Perthes.)

apart. An assistant ties the sutures as they are passed (Fig. 47), the operator's left index finger remaining in place. Now the anterior sheath of the recti, the muscles themselves, and the peritoneum are

opened by a transverse incision, which runs between the parallel lines of sutures (Fig. 48). It is readily apparent that the sutures prevent the cut muscles from retracting within their sheaths.

The closure of the wound is simple. The peritoneum (posterior sheath of the recti) is sutured, then the anterior sheath is united with sutures which include in their course the previously passed mattress sutures. No especial attention is paid to the cut surfaces of the muscle, for they are approximated by the union of the posterior and of the anterior sheaths. It has been suggested that the line of division of the recti might be made to run through one of the tendinous insertions, but this has not been found feasible because of their lack of regular distribution.

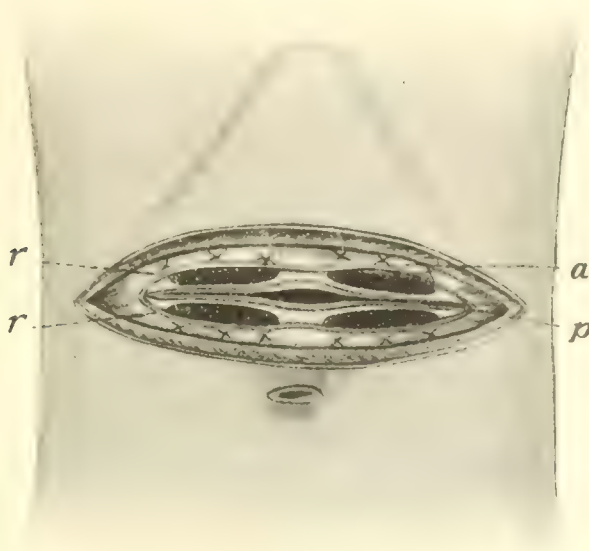


FIG. 48.—Incision completed. (Perthes.)

If more space is needed, after making such a transverse incision, it may be gained by a median vertical incision upward to the ensiform. The triangular flap so obtained is then reflected upward and outward over the free border of the ribs. In fact, this modification has been used as a *routine method for securing access to the bile passages*, with the difference, however, that the peritoneal opening is made distinctly higher than the transverse line of division of the rectus. The steps of this operation are as follows: A vertical skin incision, beginning just below the ensiform, runs a finger's breadth to the right of the median line; it turns at right angles and continues horizontally to the right, at some point above the umbilicus, (Fig. 49). Throughout the entire length of this incision, the anterior sheath of the rectus is exposed. A vertical opening in the sheath is made, exposing the inner margin of the right rectus. At the lower angle of this wound in the anterior rectus sheath, the left index finger is introduced behind the belly of the rectus, between it and its posterior sheath (Fig. 49). This is done

to guard against catching the peritoneum or peritoneal contents by interrupted mattress sutures which are now passed, fastening the rectus to its anterior sheath. As said above, the two parallel rows of

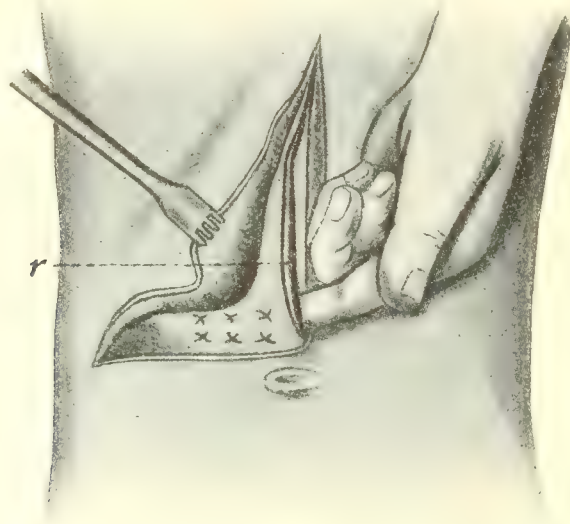


FIG. 49.—Perthes' gall-bladder incision. Vertical opening in anterior sheath of right rectus exposing inner border of muscle (*r*). Left index inserted behind muscle to prevent needle entering peritoneum while mattress sutures are being passed.

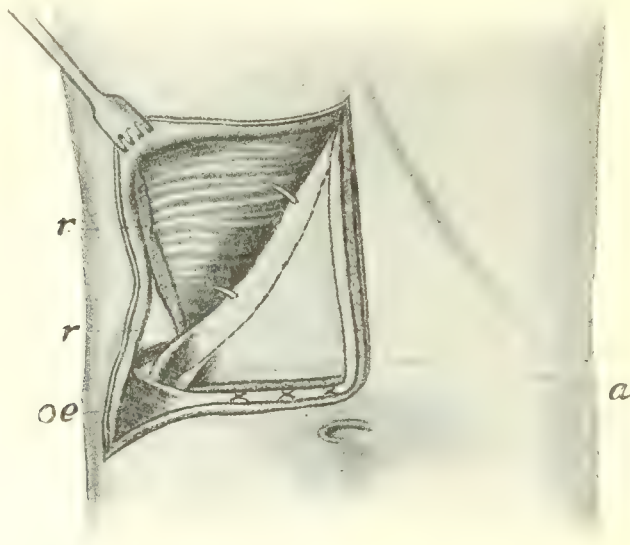


FIG. 50.—Perthes' gall-bladder incision. Rectus has been divided between rows of mattress sutures and upper part has been reflected upward and outward over free border of ribs exposing nerves which enter muscle on its posterior aspect. Dotted line indicates incision of peritoneum (posterior rectus sheath.)

sutures should lie 1 cm. apart. After tying these, the aponeurosis and muscle are divided, and the flap of rectus is reflected upward and outward over the free border of the ribs, exposing the posterior sheath of the rectus and the motor nerves which enter the muscle on its

posterior aspect. A finger's breadth from these nerves the posterior rectus sheath and peritoneum are opened by an oblique incision which runs parallel to the free border of the ribs (Fig. 50). Should more space be required in obese or very muscular subjects, it can readily be obtained by extending the horizontal skin incision still farther outward—then the oblique muscles of the abdomen are split in the direction of their fibers—the external oblique upward and outward, the internal oblique downward and outward, the transversalis horizontally outward, as in the gridiron incision for appendicitis. When drainage is necessary, it is made at the outer angle of the wound. Upon its withdrawal, the different layers of muscles close over.

This method has been used in 16 cases. In all of them the scar was firm, and the function of that part of the rectus which had been turned upward was ascertained to be perfect. There were 3 cases of calculus in the retroduodenal portion of the common duct, and 1 transduodenal extirpation of an adenoma of the papilla of Vater. In each instance an excellent exposure was obtained by this method; the wound healing was satisfactory.

In transverse incisions of the abdomen, where there is much dissection of fascial planes, with or without transverse division of muscular fibers, results will be good so long as there is no infection of the wound, but where a laparotomy is made for recent intra-abdominal suppuration, there is serious danger of extensive fascial necrosis, and of separation and retraction of the divided muscular bellies, leaving a hernia, the repair of which will be most difficult because of the absence of fascia and atrophy of the muscle.

Umbilical Tumors Containing Uterine Mucosa or Remnants of Mueller's Ducts are described by Cullen,¹ of Baltimore. They are found only in women. At some time between the thirtieth and fifty-fifth year, a small tumor develops at the umbilicus, reaching the size of a nut in the course of a few months. It may be painful, especially at the menstrual period. In one instance, at least, there was a brownish bloody discharge from the umbilicus at such times.

The overlying skin is usually pigmented, and there may be one or two bluish or brownish cysts just beneath the skin. These may rupture and discharge a little brownish fluid—old blood. On section, the nodule is found to be intimately attached to the skin, is very dense, and is traversed by glistening bands of fibrous tissue. Scattered throughout the nodule, small spaces are sometimes found, giving it a sieve-like appearance. These spaces are filled with brownish fluid. Occasionally there may be a small cyst several millimeters in diameter filled with brownish contents. Exceptionally, grayish, somewhat homogeneous areas are distinguishable in the tumor.

¹ Surgery, Gynecology, and Obstetrics, May, 1912, p. 479.

Upon histological examination, the stroma is found composed of dense fibrous tissue. Bundles of non-striated muscle are noted here and there in the fibrous stroma.

Scattered throughout the field are glands, round, oval, or irregular.

The gland picture is that of the uterine mucosa with its typical glands and its characteristic stroma. The typical menstrual reaction is often present, as shown by the pain in the nodule at the periods, the accumulation of old menstrual blood with the formation of small cysts, and, in at least one instance, by the occasional discharge of blood from the umbilicus. In one case, one or two of the glands opened directly on the surface, thus allowing free escape of the menstrual blood.

In all, 9 instances of this condition have been recorded.

Ileus Following Laparotomy in Extreme Trendelenburg Position. At the March meeting of the Berlin Surgical Society (1912) Neupert¹ reported the case of a woman who had been operated upon for ruptured ectopic pregnancy. Ileus gradually developed. Four days later, at a second operation, the omentum, which was found displaced upward, was considered to be the cause of the ileus because the transverse colon was found collapsed. A few hours later the patient died. Autopsy revealed a long mobile cecum, which had been turned back along the ascending colon up to the liver, and which had caused valve-like closure of the gut. Upon replacing the cecum, the point of reflection was found to be narrow; inserted into it was a broad peritoneal band which had its origin from the upper part of the lateral abdominal wall.

The displacement of the cecum was caused by the high elevation of the pelvis at the first operation, and postoperative distention led to complete closure of the kinked gut. Similar cases have been reported by Schauta, Kraske, Pasteau, and Le Dentu.

Undue Catharsis before Laparotomy as a Cause of Postoperative Distention is the subject of a most sensible paper by Quain.² Two years ago he noticed that most of the patients who were subjected to emergency abdominal operations, such as strangulated hernia or acute appendicitis, suffered but slight discomfort from postoperative distention. During the same time, other patients, who had been deliberately prepared for operation, and who had received fully as careful and delicate handling of the peritoneum and viscera as the former patients, suffered much more from postoperative meteorism and pain. The relation between operative trauma and postoperative gas-pain was decidedly in favor of the "unprepared cases."

A closer study led Quain to suspect that this difference must lie in the preparation of the patient for operation. Several things indicated

¹ Zentralbl. f. Chir., 1912, p. 646.

² Journal of the American Medical Association, July 6, 1912, p. 27.

that the operative technique was not the essential factor. For example, on one hand, in operation upon a strangulated hernia, where no laxative had been employed, and where the intestine was handled and rubbed with fingers, gauze, and instruments, and perhaps even resected, comparatively little gas would be formed in the bowel after operation. Again, in acute appendicitis, although the peritoneum was opened freely, and although gauze pads were laid over the omentum and numerous loops of intestine and held firmly against the peritoneum by intra-abdominal pressure, there was surprisingly little meteorism afterward. On the other hand, after the use of purgatives preparatory to interval appendectomy or operations in the pelvis or upon the gall-bladder, two or three days of intra-abdominal distention and distress often followed before the bowel could be induced to functionate properly.

Because of these observations it was decided, by way of experiment, to discontinue all purgatives before operations, except for special reasons in rare instances. Instead of the classical dose of calomel and salts, two or three high enemas were given to flush out the colon.

Quain has followed this practice for over a year, to the great satisfaction of patients, nurses, and surgeons. His material included operations on the stomach, gall-bladder and ducts, intestine, uterus, tubes, and ovaries.

"A bowel that has not been vitiated by a saline scouring is in condition, physiologically and bacteriologically, to prevent the excess formation of gases, and to expel those that do form. It is the gas distention which causes the bulk of postoperative distress. If this complication is reduced to a minimum, fecal contents are taken care of by normal peristalsis or by enemas, if required."

The following are the most important conclusions reached by Quain:

The food normally passes rapidly from the stomach and through the small intestine. The small intestine is practically empty six hours after an average meal. In the cecum and colon, the bowel-contents remain for from twenty-four to forty-eight hours.

The maintenance of a certain equilibrium between the physiological and bacterial process in the intestine is necessary for normal bowel function. Saline cathartics disturb this poise to a marked degree. After the intestinal mucosa has been depleted and exhausted by any powerful cathartic, some time is required to recover its energy. During this period bacteria flourish unmolested by intestinal ferments.

Intestinal antisepsis is, at best, of unknown and doubtful efficacy; a comparative asepsis is practical.

An artificial evacuation of the large bowel, satisfactory for most surgical and many other purposes, does not require the ingestion of any drug acting on the small intestine. High rectal injections are efficient and cause less damage and discomfort.

A cathartic given in the beginning of an acute intra-abdominal infection is a dangerous practice and contrary to modern scientific knowledge and experience. Numberless gravestones mark the disregard of this principle.

Patients who are prepared for laparotomies by a restricted diet and rectal injections have a much more pleasant postoperative recovery than patients who have been purged.

Plain Water for Proctoclysis is being widely adopted to the exclusion of normal saline solution. The large intestine tolerates warm water as well without salt as with it. Thirst is alleviated more quickly and effectually. The publication of Trout¹ enlarges on the point just mentioned.

Hormonal. Many articles on the untoward effects of this preparation have appeared during the past year. They all indicate its unreliable and dangerous characteristics. Many instances of extreme collapse, and several deaths, have followed its administration. There is no way of foretelling which are the unsuitable cases. As indicated last year, this preparation has no place in therapeutics.

Pituitrin is ardently advocated by Klotz² as a postoperative remedy in abdominal cases. According to him, (1) it raises blood pressure and improves the circulation; (2) it stimulates all smooth muscle, hence increases peristalsis, and (3) it increases diuresis.

Because of its remarkable ability to stimulate uterine contraction, it has been extensively used by obstetricians. No ill effects have been reported.

Camphor Oil Treatment of Peritonitis. The interesting experiments of F. Heimann³ are worth recounting in part. Heimann found that neither olive oil nor camphor in oil, injected into the peritoneal cavity, protected animals from infection following subsequent inoculation of pathogenic organisms into the peritoneal cavity, nor was there any delay in absorption of the organisms. Furthermore, camphor oil is not a harmless or innocuous substance. It was found that 10 per cent. camphor in oil was fatal to the animals, while a 2.5 per cent. solution evoked severe toxic symptoms.

These experimental findings have received confirmatory evidence in the article by Rübsamen.⁴ He reported putting 170 c.c. of 10 per cent. camphor oil into the abdomen just before closure. Camphor poisoning ensued with death at the end of fifty-five hours. At post-mortem there were still 70 c.c. of camphor oil in the peritoneal cavity.

Hoehe,⁵ who advocates the use of camphor oil, replied to Rübsamen's

¹ Journal of the American Medical Association, 1912, vol. lviii, No. 18.

² Münch. med. Woch., 1912, p. 2047.

³ Zentralbl. f. Chir., 1912, p. 1672.

⁴ Zentralbl. f. Gyn., 1912, No. 31.

⁵ Ibid., No. 32.

statement saying that 10 per cent. was too strong. He recommended 1 per cent. camphor oil, from which no ill effects were ever seen.

Besides these two articles, there has been much discussion in the literature regarding oil, with or without camphor. Some men have claimed brilliant results, and others have failed to note any effect which could be ascribed to action of the oil. The intraperitoneal application of both iodine (see below) and camphor oil, are attempts to prevent the consequences of inadequate asepsis by the use of antiseptics.

As to its role in preventing adhesions, the fact that oil will rise to the uppermost part of the abdomen is not mentioned in the articles I have read. It is hard to see how any one who puts oil into the pouch of Douglas can expect it to remain there, except with the patient in the extreme knee-chest position.

According to the practical experience of the Mayos, and the experimental evidence obtained by Ligabue (see below), vaseline is the most suitable substance for preventing adhesions.

Iodine.—Payr¹ and others recommend applying tincture of iodine to the mucosa which is exposed in the course of an intestinal suture anastomosis. They have shown that this effectually sterilizes the mucous surfaces. Further, it is stated that application of iodine to serous surfaces insures the formation of adhesions. Many German surgeons have adopted this view.

A timely note of warning against this promiscuous use of iodine has been sounded by Fieber,² an assistant at Föderl's clinic, in Vienna, where tincture of iodine has been employed for several years past as a routine disinfectant in all sutures of the intestine. In this clinic it was noticed that the suture lines leaked in a number of cases, although methods of union were employed which experience of years had shown to be reliable. The impression began to form that the use of iodine was responsible for the leakage. This was finally confirmed by the autopsy findings in a woman who died of peritonitis following the extirpation of a cecal tumor. At operation, both ends of the gut were closed blindly by layer suture, and a side-to-side ileotransversostomy, with three rows of sutures, was made. At autopsy there was a total necrosis at all three sites of suture. These areas of necrosis corresponded exactly to the application of the iodine solution. The circular necrosis of the side-to-side anastomosis was especially characteristic and convincing. The rest of the gut, although inflamed, had adequate circulation.

The Disinfection of Mucous Membranes with 5 Per Cent. Thymol Alcohol. As the result of experiments upon dogs, Hoffman,³ Chief of Clinic at Greifswald under Pels-Leusden, has reached the following conclusion:

¹ Zentralbl. f. Chir., 1912, p. 386.

² Ibid., p. 1161.

³ Bruns, Beitr. z. klin. Chir., Band viii, Heft 3, p. 431.

Five per cent. thymol alcohol is suitable not only for disinfection of the skin, but also for rendering mucous membranes free from micro-organisms. In operations in which the intestinal lumen is opened, the isolated portion of the stomach or gut is wiped dry. A gauze sponge soaked in 5 per cent. thymol alcohol is applied to the mucous membrane. This is removed, and is followed by another saturated sponge. The application should not last longer than one minute, or, at the most, two minutes. Beyond this, possible necrosis may occur. The solution should not touch the serous surfaces. This method of disinfection is naturally available when the disinfection of any mucous membrane is desired, and is especially recommended for gynecological work.

Iodine and thymol alcohol are excellent disinfectants. Their successful employment requires an accurate practical knowledge of their local action on the tissues. With the proper technique, it is unnecessary to employ antiseptics while suturing intestine.

The Prevention of Peritoneal Adhesions has been made the subject of extensive experimental study by Ligabue.¹ Olive oil, lanolin, rubber solution, and gelatin all gave rise to adhesions. Vaseline did not cause adhesions, and was to be seen after five days still unabsorbed and adherent to the intestinal serosa. Furthermore, it was found that vaseline prevented adhesion of injured peritoneal surfaces. Gelatin showed similar qualities, but to a lesser degree. The other substances had no influence in preventing the development of adhesions. The Mayos apply vaseline to surfaces which have been denuded of their peritoneal covering.

Poisons Excreted by the Commoner Animal Parasites of the Alimentary Canal are of importance to the surgeon because occasionally, at laparotomy for appendicitis or ileus, some sort of intestinal worm may be revealed as the exciting cause. Although a number of articles recounting such experiences are published each year, the actual significance of worms in this connection has not been made clear.

The symptoms of patients with worms are most varied. Naturally, the local intra-abdominal conditions, as just remarked, are seen more frequently by the surgeon, while the anemias and the multitude of nervous manifestations are mostly observed by the internist.

The abdominal symptoms are either those of ileus or of peritonitis. The ileus may be due to a local spasm of the gut in the presence of a few worms, or a ball of worms may actually obstruct the intestine. Peritonitis at first is serous or serofibrinous. It may remain diffuse or become localized. When an abscess forms, and communication is established between it and the gut, it may contain worms (these are the so-called worm abscesses).

Systemic effects are chiefly referable to the nervous and hemopoetic

¹ Clinico Chir., 1911, No. 9.

systems. The nervous symptoms may vary from malaise to the gravest forms of hysteria, and from irritability of temper to general convulsions. The anemias due to worms require no further mention.

While it is often surmised that local irritation may lead to nervous disturbances, that anemia may be due to the blood-sucking habits of the worms, and that hunger and loss of weight occur because the worms absorb much food, little if any mention is made of the poisons given off by these parasites, and the possible general or local effects from their absorption.

In a most comprehensive paper published in 1897, Peiper¹ stated that not only ascaris, but also oxyuris, the different varieties of tapeworm, and trichinae—all give forth poisons, the absorption of which accounts for the variable clinical pictures presented by people harboring worms. There is a very complete list of references at the end of Peiper's paper.

While more attention has been paid to the poisons present in ascaris, the similar character of symptoms in persons having other varieties of worms justifies the opinion that such symptoms do not arise from the purely mechanical irritation of the parasites, but rather from the local and general effect of their poisons.

Flury's² exhaustive report upon the poisons of ascaris is of the greatest interest. He found in the body proper and in the excrements of ascarides, innumerable substances capable of causing local irritation, hyperemia, severer grades of inflammation, and even necrosis. There were volatile aldehydes of fatty acids, free volatile fatty acids, various alcohols, and ethyl, butyl, and amyl esters. The latter are the acrid volatile substances given off upon opening the bodies of the worms. They have a sharp, peppery odor, and cause an intense irritation of the conjunctiva and nasal mucous membrane, which has frequently been experienced by biologists who dissected them.

It is known that absorption of esters of acids may cause urticaria. Free acids not only irritate, but actually injure, the intestinal mucosa. Disturbances in digestion may be purely intoxication symptoms, and may have nothing to do with mechanical obstruction. Chronic poisoning from absorption of aldehydes, especially atypical combinations of the amyl group, may explain all nervous symptoms—these include hallucinations, chorea, hysteria, epilepsy, tetanic spasms, delirium, and psychic disturbances. There were other acids whose action was similar to formic acid. There was a capillary poison similar to that called sepsin. There were poisonous substances whose action resembled that of atropine and conium.

The anemia, in people with worms, comes not only from mechanical injury and absorption of food, but far more from the absorption of

¹ Deutsch. med. Woch., 1897, No. 48, p. 763.

² Archiv f. exper. Path. u. Pharm., March, 1912, p. 275 to 392.

hemolytic substances, reducing substances, and those which lessen coagulation. To these poisons from the living worms may be added the products of decomposition should the worms die. Flury concludes that not one, but innumerable substances having potent pharmacological effects are present in ascarides. Their absorption varies in quality and amount, which accounts for the variation in symptoms arising from this intoxication. Thus only a quota of those having worms exhibit nervous symptoms.

The following case has recently been reported by J. C. Huber¹ as an example of the irritant effect of ascaris upon the human intestine:

A boy, aged thirteen years, was operated on for acute appendicitis. There was plenty of free fluid in the belly. The appendix was normal, but 20 cm. of ileum close to the ileocecal valve showed acute inflammation, which gradually faded into the normal gut above and below. The mesenteric lymph nodes were enlarged. In the inflamed part of the ileum and above it worms (ascarides) could be felt. After operation these were discharged under appropriate medication.

THE STOMACH

Röntgen Diagnosis of Stomach Diseases. Last year I dwelt at considerable length on Claremont and Haudeck's article dealing with the Röntgen diagnosis of stomach diseases. Recently, Faulhaber² has published a short monograph in which there is considerable new material. To present the newer facts properly, it is necessary to repeat much of what is already well known.

The various modifications of the bismuth meal have been narrowed down to the one advocated by Rieder (500 grams of gruel, and 50 grams of bismuth carbonate). Barium sulphate has been recommended because of its cheapness, but nausea has followed its administration. A simple substitution for the Rieder meal consists in the Kaestle mixture of water, 40 grams of bismuth, and 80 to 100 grams of bolus alba. Examination by fluoroscopy has been found just as valuable and necessary for diagnostic purposes as *x-ray* plates.

Both Rieder and Holz knecht have described what they believe to be normal types of stomach (Figs. 51 and 52). Experience has shown that each is correct but that the type described by Rieder is seen in about 90 per cent. of the cases, while that of Holz knecht occurs in only 10 per cent.

An accurate and easy way of ascertaining the *tone* of a stomach is to administer a small amount of bismuth mixture. A normal stomach

¹ Münch. med. Woch., December 3, 1912, p. 2669.

² Die Röntgendiagnostik der Magenkrankheiten, Sammlung Zwangl. Abhandlungen a. d. Gebiete d. Verdauung u. Stoffwechsel Krankheiten, Band iv, Heft 1.

will fill up, so that the level of the bismuth reaches to the region of the diaphragm, and the amount of gas above it is very small. The administration of more bismuth does not lengthen the stomach, but merely broadens it uniformly. Faulhaber states that such a finding is the best indication of normal stomach tone, and that both the Rieder and Holzknecht forms exhibit this quality equally. Under maximal distention, the pylorus moves somewhat toward the right. A sphincter antri, as such, does not exist. Instead, we see a more active and powerful peristalsis in the antral region of the stomach.

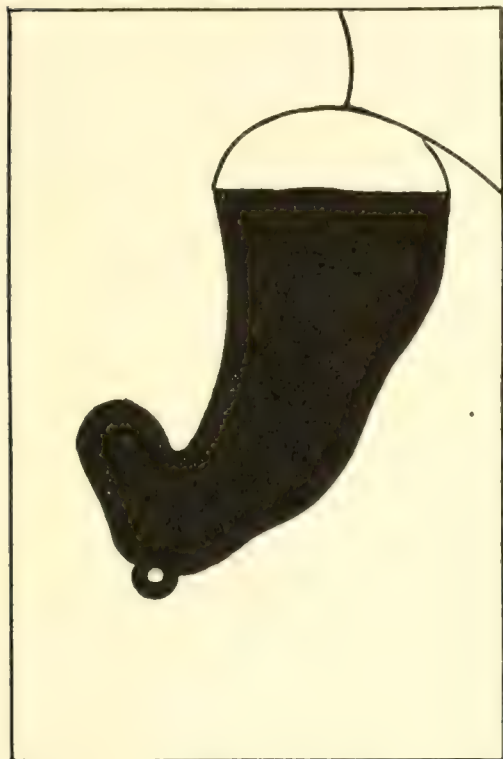


FIG. 51.—Normal stomach of the Rieder type, 90 per cent. (Faulhaber.)



FIG. 52.—Normal stomach of the Holzknecht type, 10 per cent. (Faulhaber.)

GASTROPTOSIS is not always accompanied by loss of tone. Many stomachs which present marked ptosis are nevertheless perfectly normal. Faulhaber gives the following characteristics as typical of a *pure gastroptosis*:

1. Low situation of the body of the stomach.
2. Pyloroptosis.
3. Lengthening of the stomach.
4. Intact tone (lack of asymmetrical dilatation).

Comparison of Figs. 53 and 54 will show that one presents a ptosed stomach with normal tone (Fig. 53), whereas the other shows atony of a ptosed stomach (Fig. 54). When normal tone is present, ingestion of 30 c.c. of the bismuth meal is often sufficient to give a picture like that of Fig. 53. These findings explain why so many people

with ptosed stomachs nevertheless enjoy perfect gastric function. Faulhaber believes that the relaxation of the abdominal walls, as seen in multiparæ and under similar circumstances, is not a very important cause of gastropptosis. On the other hand, the most frequent and extreme grades of gastropptosis are associated, in at least 90 per cent. of the cases, with the symptom-complex described by Stiller as "asthenia universalis." Faulhaber considers gastropptosis without loss of tone to be the result of abnormally long growth of the stomach, which is predisposed to, by a narrowness of the lower thorax, in these individuals.

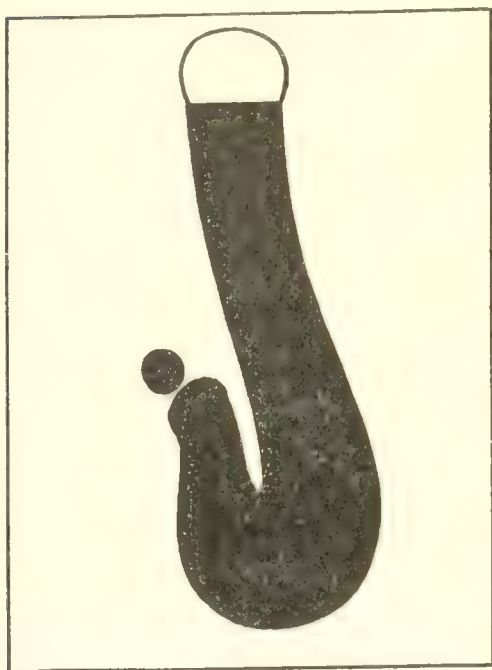


FIG. 53.—Marked gastropptosis with preservation of normal tone. (Faulhaber.)

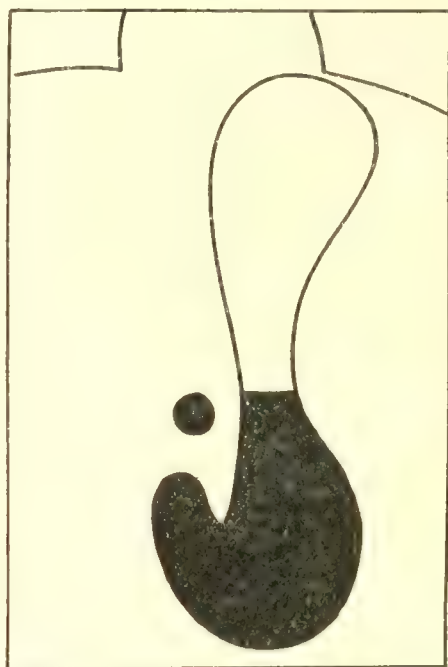


FIG. 54.—Gastropptosis with loss of tone. (Faulhaber.)

Certain authors, notably Stiller, maintain that the picture of a stomach filled with a bismuth meal is a purely artificial one. They state that the bismuth exerts an undue stimulus upon the stomach wall, which then shows abnormally energetic contractions. Groedel and Hesse both proved that the same pictures could be obtained when powdered bone took the place of the bismuth, and thus completely disproved this contention. In short, while atonic stomachs usually are also ptosed (Fig. 54), conversely, ptosed stomachs are by no means always atonic. Faulhaber states that *every ptosed stomach*, whether possessed of a normal tone or not, *invariably gives splashing sounds upon palpation*.

DILATATION OF THE STOMACH. There is no such condition as a pure atonic dilatation of the stomach. Modern clinical investigation has shown that stagnation upon the basis of a primary, purely func-

tional weakness of the stomach musculature does not exist, but that, in all such cases, pyloric obstruction is present. The roentgenological characteristics of a dilated stomach are the following (Faulhaber):

1. Increased size of the stomach.
2. Stagnation.
3. Visible pathological peristalsis.

In extreme dilatation, the bismuth meal occupies only the lowest part of the stomach as an abnormally wide, deeply situated half-moon (Fig. 55). Its upper level is horizontal, but is not sharply defined.

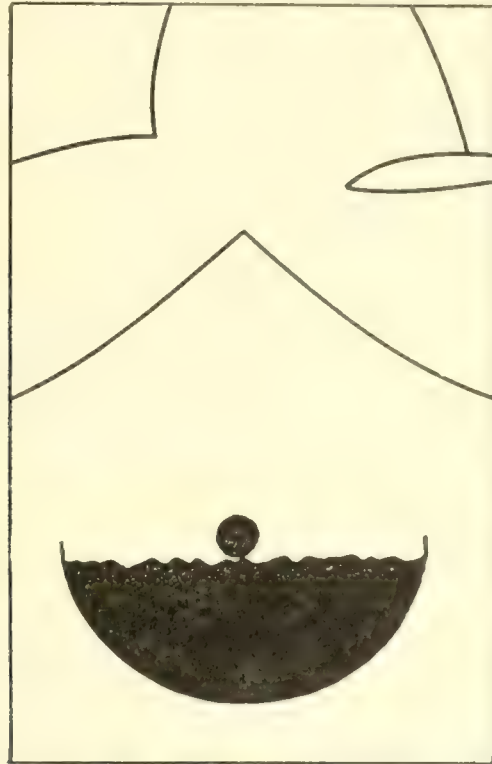


FIG. 55.—Extreme dilatation secondary to benign pyloric stenosis. (Faulhaber.)

This half-moon reaches quite far to the right (increased "rechtsdistanz"). Neither the pylorus nor the body of the stomach are visible. The lack of sharp demarcation of the upper margin of this half-moon is due to the fact that it is overlaid by the stagnating fluid contents of the stomach (the bismuth meal, having a greater specific gravity, has sunk to the bottom). There is very little air in such stomachs, and this small collection may be seen high up, close to the diaphragm, above the level of the stagnant fluid ("intermediärschicht"). It is unnecessary to fill the stomach completely with bismuth mixture—a diagnosis can be made without this procedure—but, should it be desired, the stomach can first be emptied of its contents and then filled with bismuth by means of the stomach-tube.

Regarding abnormal peristalsis in such stomachs, in 1908 Faulhaber called attention to abnormally deep contractions as pathognomonic of pyloric stenosis. Holzkecht, and others, state that such

contractions are also present in certain neuroses. Flat, antiperistaltic waves along the greater curvature (from right to left) have been observed, but authorities have not reached any agreement regarding their exact significance. Jonas considers antiperistalsis pathognomonic of pyloric stenosis. This has been denied by others. Haudeck believes it to occur with ulceration near the pylorus.

ULCER OF THE STOMACH. A *simple ulcer* of the gastric mucous membrane does not retain the bismuth any longer than the rest of the stomach—the bismuth mixture does not adhere to the ulcer's base. All competent observers agree upon this.

Haudeck's statement, quoted last year in PROGRESSIVE MEDICINE, was to the effect that an ulcer anywhere in the stomach might give rise to pylorospasm. Faulhaber is not of the opinion that pylorospasm is due to the hyperacidity which so often accompanies ulcer. He considers it impossible to make a differential diagnosis by means of the x-ray between pylorospasm due to hyperacidity, and that due to ulcer, maintaining that an ulcer causes pylorospasm only when it is situated upon the pylorus or immediately adjacent to it. He asserts that inasmuch as a small erosion of the mucous membrane cannot be demonstrated by external palpation of the stomach, and inasmuch as most of the authors interested in this subject do not agree with Haudeck's opinion (that hyperacidity by itself can cause pylorospasm), his own view that when pylorospasm and hyperacidity exist, the spasm is probably due to some small undemonstrable erosion, deserves consideration. In other words, pylorospasm indicates an ulcer of the pylorus. Given a delayed emptying of the stomach in the presence of normal or even exaggerated peristalsis (thereby excluding muscular weakness), plus delay in emptying of the stomach (remnants visible at the end of six hours), an obstruction at the pylorus—pylorospasm may be assumed.

To sum up, simple ulcer of the stomach cannot be proved by the x-ray. At the most, the Röntgen examination can, under certain circumstances, be an adjuvant to other clinical findings. The differential diagnosis between intermittent hour-glass stomach and the permanent form will be discussed elsewhere.

Callous Ulcer of the Stomach. The characteristics of this form were described at length in my article last year. A differential point between a callous ulcer and one which has penetrated entirely through the stomach wall is that, in the latter, its upper half, above the level of the bismuth, is filled with air, whereas in the former type, the entire ulcer is outlined by the bismuth (Figs. 56, 57, and 58). In certain cases (with favorable position) it was possible to keep the ulcer filled with bismuth, long after the stomach had emptied itself.

Persistent hour-glass stomach indicates a florid ulcer somewhere on the periphery of the contracted muscular ring.

Ulcers which are on the anterior or posterior wall cannot be demonstrated by the Röntgen rays in the usual position of the patient (antero-



FIG. 56.—Callous ulcer of the lesser curvature. (Faulhaber.)

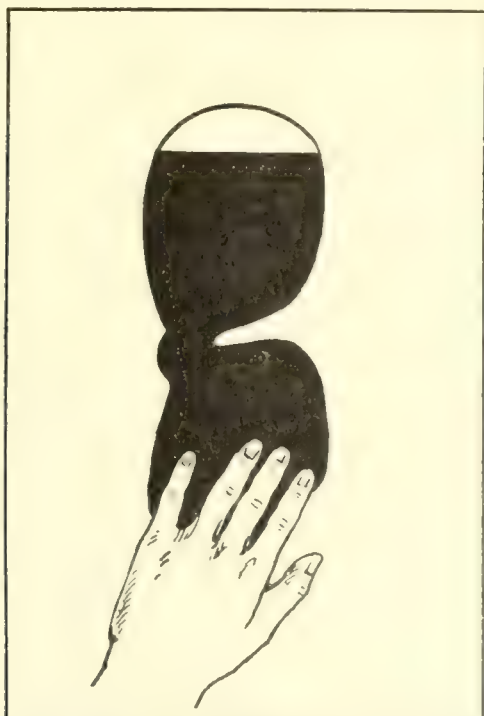


FIG. 57.—Palpation of hour-glass stomach due to callous ulcer. Pressure of hand has filled ulcer defect with bismuth, rendering it visible, and has demonstrated existence of hour-glass form. (Faulhaber.)

posterior illumination). Turning the subject slightly to one side or to the other may bring out the abnormal bulging sought for.

Ulcers of the pylorus and its neighborhood are so difficult of demonstration by the x -ray that in spite of their frequency in this locality, none have been diagnosticated by this means.

The disappearance of hour-glass contraction after administration of atropine has been used by Rieder to differentiate functional from organic causes of this condition.

According to Faulhaber, there are *three types of hour-glass stomach* which occur *in the presence of florid ulcer* of the body of the stomach.

1. A purely organic form, due to cicatricial contraction of the ulcer, or to the accompanying perigastric inflammation.

2. A purely functional form, due to local tetanic contraction of a circular muscle ring.

3. A mixed form, with moderate organic narrowing plus extreme tetanic contraction.

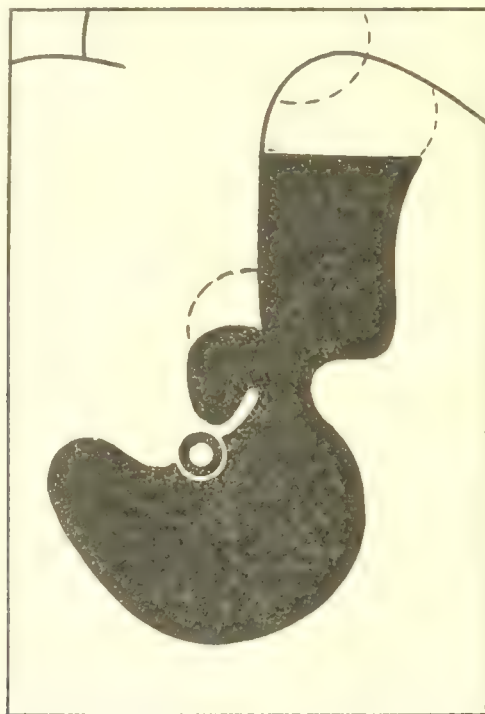


FIG. 58.—Penetrating ulcer. Note air bubble and mushroom shape. Operation revealed penetrating ulcer of lesser curvature with base in the liver. (Enderlen.)

All of these appear under the x -ray as persistent hour-glass stomach. The first form is rarer than the others. The two latter forms can be differentiated from the first by watching the way in which the bismuth meal fills up the stomach. When, on the one hand, the communication between the two halves seems narrow, and on the other hand, one observes that the pyloric portion is immediately and completely filled upon ingestion of the bismuth meal, this indicates that either the second or third forms are present, and, moreover, one can safely assume that an ulcer exists.

The absence of a tetanic hour-glass contraction does not exclude the presence of a callous ulcer, for the tendency to localized spasm is not

present in all cases. Why this is lacking in certain cases is not known. The combination of the "Nischensymptom"—filling of ulcer excavation—plus the localized hour-glass contraction is pathognomonic of ulcer, and, according to Faulhaber, occurs quite frequently.

Penetrating Ulcers. In a typical case of this condition, a circumscribed round spot can be seen on the lesser curvature. At times it has a broad base, but more frequently a mushroom shape (Fig. 58) close to the normal stomach outline. There may be no visible communication with the stomach, so that this spot resembles an island near the mainland. The upper part is filled by a bubble of air. It is possible to empty the adjacent part of the stomach by manual pressure (under the fluoroscope), whereas the spot cannot be removed by this means, because a cavity with rigid walls exists, the contents of which cannot be influenced by palpation. By suitable posture of the patient this cavity can be kept filled long after the stomach has emptied itself.

To conclude, the difference between penetrating and non-penetrating callous ulcers can be summed up as follows: *Penetrating ulcers* show large deposits of bismuth far removed from the stomach, at times without visible communication. The three-layer symptom, bismuth, fluid, and air from below upward, and its persistence after emptying of the stomach are characteristic of this condition. *Non-penetrating callous ulcers* are indicated by small deposits of bismuth in direct communication with the stomach, without air bubbles (Figs. 56 and 57) which promptly empty themselves at the same time with the stomach.

HOURLASS STOMACH. Apparent hour-glass stomach, especially the type due to atony, has been discussed in previous numbers of *PROGRESSIVE MEDICINE*. Artificial constrictions from too tight-lacing, or from pictures taken while the patient lies in the dorsal position, can be avoided by removing their cause.

Intermittent hour-glass stomachs are caused by spasms which indent the greater curvature. According to present opinions, these are due either to superficial ulcerations of the gastric mucosa or to neurosis. Constancy of location upon repeated examination speaks for the former, while varying position is suggestive of the latter. As said before, atropine has been used with some success to differentiate the intermittent from the organic form. However, it must be remembered that there are persistent forms of hour-glass stomach (uninfluenced by atropine) of purely functional character, which are usually caused by ulcer.

Organic hour-glass stomachs are due to

1. Cicatrix of a previously existing ulcer.
2. Cicatricial contraction of a still florid ulcer.
3. Perigastric adhesions and bands.
4. Carcinoma.

In contradistinction to Haudeck's opinion, Faulhaber believes that there is no fixed rule regarding the relative size of the upper and lower sacs of an hour-glass stomach.

The coincidence of a localized point of tenderness with the site of stenosis is not diagnostic of a florid ulcer. This finding occurs almost regularly in the other forms of organic hour-glass constriction. The presence of small, irregularly grouped, particles of bismuth, scattered in the neighborhood of the isthmus joining the upper and lower sacs (at the point where the stomach walls are irregularly adherent) is suggestive of perigastric bands and adhesions as the cause of the hour-glass stenosis.



FIG. 59.—Carcinomas of pyloric region. *a*, carcinomatous tab of lesser curvature; *b*, the same of the greater curvature. (Faulhaber.)

CARCINOMA OF THE STOMACH. There are two main types characteristic of carcinomatous involvement; one is a circumscribed irregular mass which invades the lumen of a stomach whose outline, size, and situation are normal (medullary carcinoma). In the other there is a less extensive involvement of the lumen—perhaps none at all—with a stiffness of the wall and absence of peristalsis often together with a marked generalized narrowing of the stomach lumen (scirrhus form).

Carcinoma of the Pylorus. The absence of part of the stomach outline is very characteristic of medullary tumors in this situation. The boundary line is irregular and ill-defined, and often shows irregular tabs (Figs. 59*a* and 59*b*) ("Karzinomzapfen"). Palpation under the fluoroscope is most valuable. It is easy to see how much more certain the diagnosis becomes when a tumor can be demonstrated to correspond with the defect in outline (Fig. 60, *a*, *b*, *c*, and *d*). It

has been found that the tumors are as easily palpable in the standing position as when the patient is lying down, and that often they first become palpable under the *x*-ray, both because of their deeper location on standing, and because of the aid afforded by the *x*-rays in

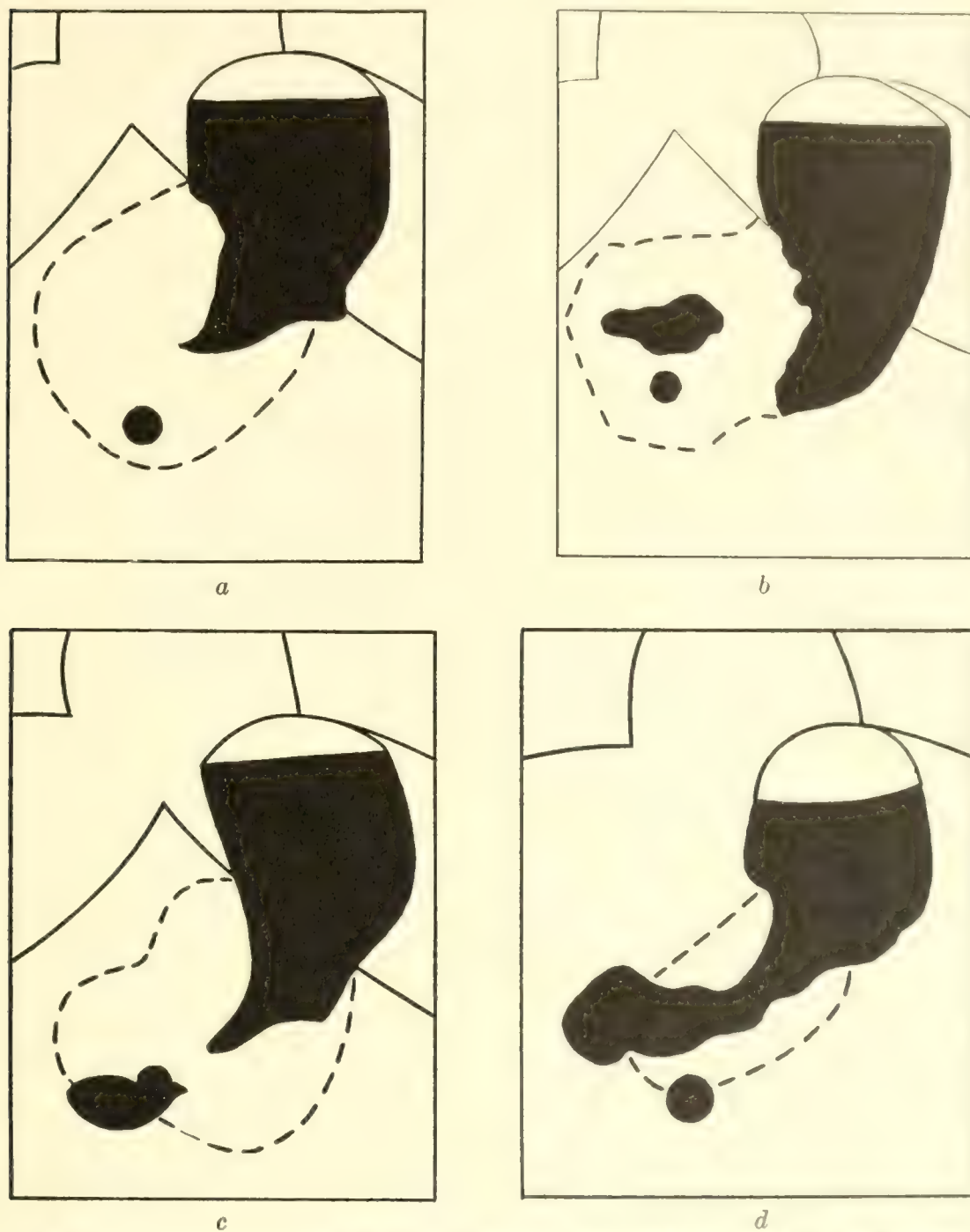


FIG. 60.—Three medullary (*a*, *b* and *c*) tumors and one scirrhous (*d*). The dotted lines show boundary of palpable tumors. Note how this corresponds to defect in normal stomach outline. (Faulhaber *a*, *b*, and *d*, Enderlen, *c*.)

identifying the palpable tumor with the visible defect in outline. As a rule, pyloric carcinomas are palpable by this means. A few, however, which had reached considerable size without becoming palpable, were always found overlaid and hidden by a much enlarged liver.

The peristaltic waves of the stomach end abruptly at the margin of the carcinomatous infiltration.

Marked retention and dilatation, accompanied by periodical attacks of copious vomiting, have been observed following medullary tumors of the pars pylorica, but there also have been instances in which the stagnation was moderate, and the stomach outline remained normal. This was accounted for by the lessened amount of food ingested because of lack of appetite. Naturally, under such circumstances, the degree of tone present, previous to the carcinomatous invasion, played a considerable role.

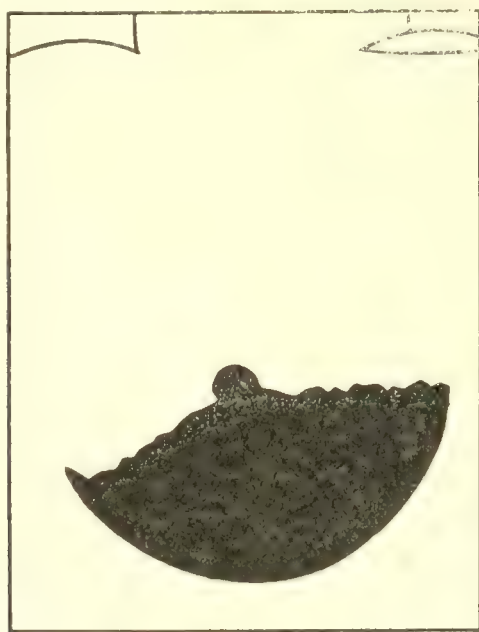


FIG. 61.—Extreme dilatation from carcinomatous stenosis in a man, aged thirty-one years. Resection of tumor. (Enderlen.)

Scirrhus tumors of the pylorus regularly cause pronounced retention. Marked hypertrophy of the stomach wall is a frequent finding at autopsy in these cases. This raises the question whether hypertrophy developed as the result of the pyloric carcinoma, or whether it developed because of a preëxisting cicatricial pyloric stenosis, on the base of which carcinoma subsequently took its origin. Extreme grades of hypertrophy, or marked dilatation, strongly indicate the latter possibility. Be that as it may, the recognition of such a defect in outline is difficult, on account of the smallness of the existing tumor and the extreme grade of dilatation. Because of this dilatation, it is often impossible to fill the pyloric portion of the stomach with bismuth—one only obtains the large, broad half-moon, with increased displacement to the right (see gastric dilatation, Fig. 55). A downward oblique deviation of the upper margin upon the right side is very suggestive of carcinoma (see Fig. 61). When such is the case, the tumor has already reached a considerable size.

To demonstrate the presence of smaller tumors, it is better to empty the stomach with the tube and fill it by the same means with bismuth mixture. Even then the determination of whether a defect in outline (carcinoma) is present, may be difficult or indeed impossible, since the pyloric portion of the stomach in cases of purely cicatricial stenosis may be distended to an equal degree, and may have a similar abrupt demarcation toward the duodenum.

Carcinoma of the Body of the Stomach. Those tumors involving the greater or lesser curvature or the entire circumference of the stomach have been described in my previous article (June, 1912) and need no further mention here. Small tumors of the anterior or posterior wall may not be visible, except by palpation under the fluoroscope, or by lateral illumination. A pretty differential point between tumors of the anterior and posterior wall can be obtained by palpation. If the growth be of the posterior wall, pressure of one finger merely causes a circumscribed circular point of transparency, whereas if the tumor involve the anterior wall, pressure upon it causes a more extensive irregular area of transparency. Dense attachment of the transverse colon to the stomach can be demonstrated by filling both organs with bismuth, and attempting to separate them by palpation. Normally this can be done.

Tumors of the middle part of the stomach are palpable in 70 to 80 per cent. of the cases.

Carcinomas of the Pars Cardiaca. Inflation, either by means of the stomach-tube, or by some suitable carbonic acid gas method, will show the defect in outline. In these cases the fundus of the stomach is habitually filled with air to a degree beyond normal. The narrowed cardia does not allow swallowed air to escape readily. It is often impossible to administer sufficient bismuth to fill the upper part of the stomach with the patient standing. Hence, if inflation is not satisfactory, illumination in the dorsal or ventral position may be of service.

In conclusion, it may be said that palpable tumors due to scirrhus carcinoma are far less frequently observed than those from other forms of cancer. The coincidence of a palpable tumor with a defect in outline is one of the most valuable findings for diagnosing cancer of the stomach. Faulhaber believes that 20 to 30 per cent. of carcinomas of the stomach cannot be demonstrated by any other clinical method except the *x*-ray, with the exception, perhaps, of gastroscopy. The *x*-ray has often proved the inoperability of a tumor, thereby avoiding useless exploratory laparotomy.

Faulhaber states that in no case has he been mistaken in excluding a carcinoma of the stomach when the gastric symptoms have existed for at least two months previous to examination, for, under such circumstances, one can be certain that the carcinoma has been latent

for some time previously, and has reached sufficient size to be easily demonstrated by the *x*-ray.

GASTROCOLIC FISTULA OBSERVED BY THE X-RAY. Voorhoeve¹ reported a case in which a gastrocolic fistula was diagnosticated exclusively by means of the *x*-ray.

The more important symptoms were as follows:

1. *After Administration of a Bismuth Meal.* (a) The immediate appearance of a bismuth shadow close to the stomach which could be demonstrated not to be in the small intestine; (b) the appearance of bismuth in the descending colon and sigmoid flexure within a few hours after ingestion, with absence of bismuth in the ascending colon and proximal part of the descending colon; (c) causing bismuth, by palpation, to pass from the stomach into the colon, or *vice versa*; (d) the simultaneous presence of bismuth in the small intestine and in the distal parts of the large intestine, while in the proximal part of the colon very little or no bismuth was present.

2. *After Administration of a Bismuth Enema.* (a) The presence of bismuth in the stomach; (b) causing bismuth to pass from the colon into the stomach by palpation; (c) the presence of bismuth in the small intestine, proving that bismuth had been present in the stomach, for, the bismuth enema had not passed beyond the ileocecal valve.

SPASM OF THE STOMACH DURING AN ACUTE GALLSTONE ATTACK has been demonstrated by Schlesinger.² From his *x*-ray observations, he has established the fact that during the acute pain of a gallstone attack, or of acute cholecystitis, there is a spasm of the entire stomach which furnishes an additional, independent source of pain.

It may be assumed that similar contractions of the stomach occur in other acute abdominal conditions, such as nephrolithiasis, pancreatitis, and appendicitis. The spasm is readily demonstrated by the *x*-ray.

Closure of Gastric Fistula. Von Hacker³ suggests the following method: The stomach must be empty. The mucous and epidermal margin of the fistula is freshened for a width of 1 cm. (*a* in Fig. 62). The peritoneal cavity is not opened, two small vertical incisions (*d, d*) of 2 cm. each, are made above and below the fistula; they pierce both skin and fascia. With a blunt instrument, tunnels are established beneath the fascia to the right and left of the fistula (see dotted lines in diagram). A silver-wire loop is then introduced through the upper opening, and is led around one side of the fistula through the tunnel already established, and out through the lower wound. A similar loop of wire is introduced through the tunnel on the opposite side. The ends of the loop which lies to the left of the fistula are now armed with needles, and are carried out through the skin 3 fingers' breadth

¹ Deutsche Archiv f. klin. med., Band cvi, Heft 3.

² Berlin. klin. Woch., 1912, No. 26.

³ Zentralbl. f. Chir., 1912, p. 769.

to the right of the fistula (*c, c*). This process is repeated with the ends of the other loop on the opposite side (*b, b*). These two loops of wire are now pulled upon, closing the fistula, and their ends are fastened in place with shot and plate. The superficial margins of the fistula are united by approximating sutures, which are removed on the seventh day. The silver wire is removed on the twelfth day.

This method is also useful for closing intestinal fistulas, providing the lumen of the intestine is sufficiently wide after closure.

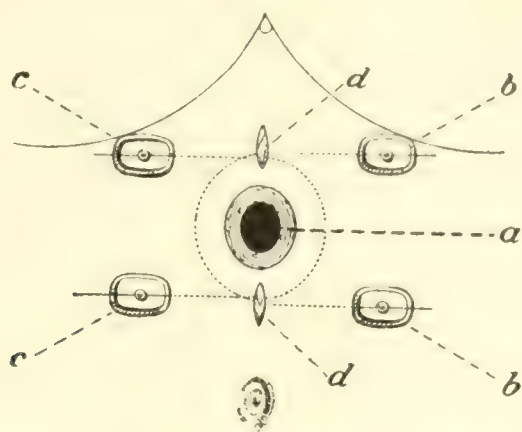


FIG. 62.—Von Hacker's method of closing a gastric fistula. *a*, freshly denuded mucocutaneous margin; *b, b* and *c, c*, ends of wire loops passed according to dotted lines; *d, d*, two small vertical incisions.

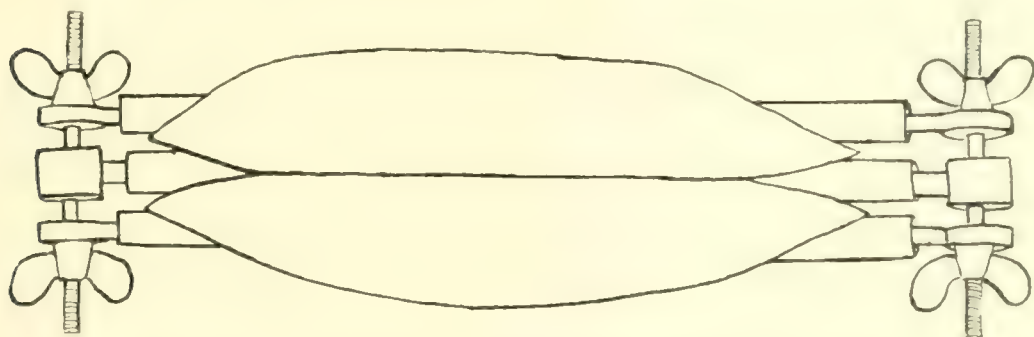


FIG. 63.—Buchanan's modification of Bartlett's clamp.

Gastro-enterostomy Clamp. Buchanan,¹ of Pittsburg, has modified Willard Bartlett's gastro-enterostomy clamp (described in this section of PROGRESSIVE MEDICINE last year) by fixing the centre bar and using a separate pair of thumb-screws for each viscus. To permit rubber tubing to be slipped over the middle bar and to facilitate removal, this bar is made in two sections, which are screwed together after the tubing is applied, and which must be separated to permit removal of the clamp after the anastomosis is finished. Fig. 63 illustrates Buchanan's instrument and his method of using it. When the viscera are first fixed in the clamp before any suturing is done,

¹ Annals of Surgery, November, 1912, p. 783.

the instrument of Buchanan is easier of application than that of Bartlett, but when the two viscera are first joined by a Lembert stitch (Fig. 64), and the original clamp is then applied (Fig. 65), it

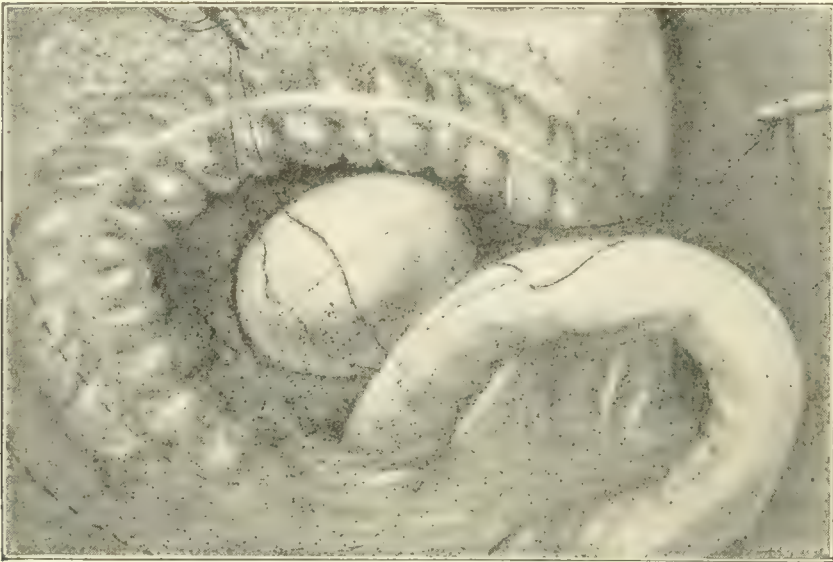


FIG. 64.—The stomach and jejunum are caught with two sutures in such a manner that the highest portion of the jejunum is applied to the lowest portion of the stomach which naturally lies contiguous to it, the object of this being that the intestine may follow its natural course when the operation is complete, as suggested by W. J. Mayo. (Bartlett.)

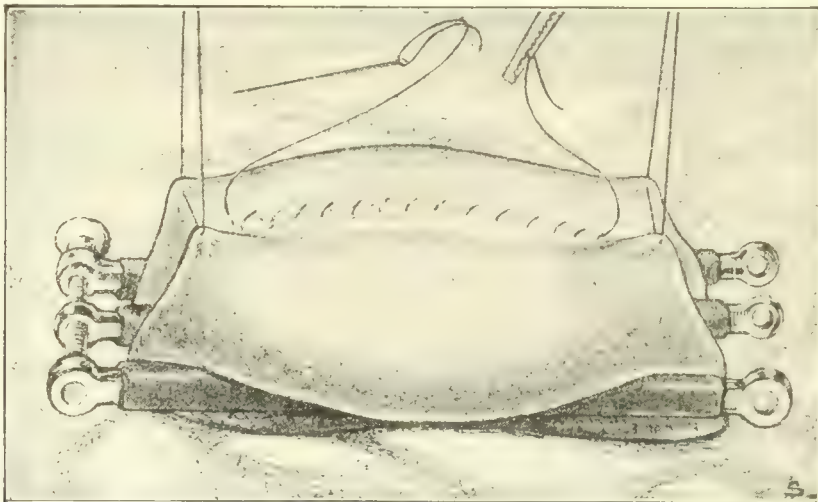


FIG. 65.—A continuous serous suture of silk has united the two points at which the viscera have been approximated by the threads referred to in Fig. 64, and now the middle blade of the gastro-enterostomy clamp has just been inserted under this union and the device is ready to be locked. (Bartlett.)

fulfils its purpose perfectly. Bartlett's original instrument having only two thumb-screws is simpler than Buchanan's, and if the anastomosis be made as recommended by Bartlett¹ his original clamp will remain the instrument of choice.

¹ Journal of the American Medical Association, February 15, 1913, p. 511.

Management of the Opening in the Transverse Mesocolon in Completing the Operation for Posterior Gastrojejunostomy. W. J. Mayo¹ points out that whereas formerly the opening in the transverse mesocolon, through which the stomach was brought out in performing gastrojejunostomy, was originally closed by suturing the torn margins of



FIG. 66.—Thin transverse mesocolon sutured to the suture line in gastrojejunostomy. (Mayo.)

the mesocolon to the posterior wall of the stomach from one-half to one inch away from the gastro-intestinal anastomosis, more recently, these sutures were considered unnecessary, and were, therefore, omitted. This omission proved to be a mistake, as shown by one case in which six feet of small intestine herniated through the opening into the lesser peritoneal cavity causing intestinal obstruction, which was relieved by operation on the twelfth day. Certain authors, instead of suturing the margins of the mesocolon to the stomach, fasten them

¹ *Annals of Surgery*, March, 1912, p. 398.

to the jejunum just beyond the gastro-intestinal anastomosis. Several cases of obstruction have been reported as resulting from this method. For a number of years past, the Mayos have turned the margin of the opening underneath, and have sutured the peritoneum of the lower surface with three or four stitches to the suture line which unites the stomach and jejunum (Fig. 66). On the whole, this technique has proved satisfactory. There were 2 cases, however, in which a fat transverse mesocolon, sutured in this way, gave rise to secondary trouble from adhesions which formed a collar-like mass around the stoma, so that cure was not obtained until a second operation was done, when the margins of the transverse colon were dissected free and united to the stomach about one inch from the suture line of the gastro-jejunosomy. Mayo recommends that the margins of the mesocolon be fastened to the gastrojejunal suture line in the majority of cases, but that when the transverse mesocolon is quite fat, the old method of suturing it to the posterior wall of the stomach be employed.

Finsterer¹ reports 5 cases from the literature of incarceration of small intestine through the opening of the mesocolon after gastro-enterostomy. To these he adds a case of his own.

The Surgical Treatment of Congenital Hypertrophic Pyloric Stenosis. In 1910, Weber² suggested a so-called extramucous pyloroplasty. This consisted in division of the serous and muscular walls of the pylorus by an incision running in a longitudinal direction, and suture of this wound in the opposite direction, according to the manner of the Heinecke-Mikulicz pyloroplasty. This method, while simpler than gastro-enterostomy or more extensive pyloroplasty, did not give complete satisfaction, as the vomiting continued for at least a week after operation. This was believed to be due to the pyloroplasty itself, which threw a transverse fold of swollen mucous membrane across the widened pyloric orifice, causing a temporary obstruction.

In 1912, Rammstedt³ published his method, which consisted in a simple division of the pyloric muscle ring down to the mucosa. No attempt was made to cover the wound with omentum. The child made a smooth recovery. Rammstedt⁴ has recently published a second case, with a similar successful result. This operation seems to be happily conceived, and eminently suited for relief of the exhausted babies, whose low vitality makes any extensive operation fraught with great danger to life. Of course, it is too early to make positive statements about the value of the method, but it certainly seems worth trying.

Hypertrophic Pyloric Stenosis in Adults is not mentioned in any of the standard English or German special pathologies to which I have been

¹ Bruns, Beitr. z. klin. Chir., Band lxxxi, p. 266.

² Berlin. klin. Woch., 1910, No. 17.

³ Med. Klin., 1912, No. 42.

⁴ Zentralbl. f. Chir., 1913, No. 1, p. 3.

able to refer. Gilbert Barling¹ has reported 2 cases of this condition. One in a man, aged twenty-seven years, suffering from symptoms of pyloric obstruction for three years previous to operation. The stomach was found to be small, its coats were hypertrophied, and a firm, massive thickening, 3 inches long, involved the whole of the pyloric canal, which was about $1\frac{1}{2}$ inches thick. The peritoneum was normal; there were no palpable scars or nodules. The fingers invaginating the intestinal wall from above and below were barely able to touch through the lumen of this stenosis. A posterior gastro-enterostomy was made, and the patient has been well for the past four years.

The second patient was a girl, aged seventeen years, with gastric symptoms of six months' standing. On admission to the hospital, she had a temperature of 103° , which was considered due to some other condition than peritonitis. A tuberculosis of the bowel was suspected. The von Pirquet test was negative. The patient slept a good deal.

At operation, the pylorus was free from adhesions and was the site of a thickening similar to that observed in the previous case. After operation, tubercle bacilli were found in the urine. A tuberculous meningitis developed from which the patient died sixteen days after operation. A complete post mortem was not permitted, but the stomach and adjacent viscera were obtained. At the pylorus there were no ulcers or scars upon the mucous membrane, and the peritoneum was normal. Microscopic examination showed that the thickening was due to overgrowth of circular muscular fibers.

Subsequent questioning of relatives failed to elicit any history suggestive of pyloric obstruction during the infancy of either of these patients.

Gastric Ulcer. THE ROLE OF THE GASTRIC JUICE IN THE PATHOLOGY OF GASTRIC ULCER is the title of a paper read by C. Bolton² at this year's meeting of the British Medical Association. The previous communications of this author have contributed much to our knowledge regarding the pathology of gastroduodenal ulceration. The results of a series of excellently conceived experiments, embodied in this year's paper, shed still more light upon the subject.

The method by which the experimental ulcers were produced, was described some years ago, and consisted in the injection of a toxic serum which had the property of attacking the gastric mucous membrane and producing gastric ulcers. It did not matter whether this serum reached the stomach through the general blood stream, or was injected directly between the coats of the stomach. In either case ulceration was produced, but, in the former, general toxic symptoms resulted and the animals often died, while in the latter, only slight

¹ *Lancet*, January 25, 1913, p. 231.

² *British Medical Journal*, November 9, 1912.

symptoms resulted and an ulcer was formed at the site of injection. For the sake of convenience, the method of injection into the stomach wall was therefore employed. An ulcer of any size could be produced at any position in the stomach without the animal suffering more than a few hours' inconvenience from the general toxic effects of the serum.

The serum was obtained from an animal (a goat) which had been immunized by repeated injections of the gastric cells of another animal (cat). The lesions produced by the serum were necrotic in character. The necrosis involved the mucous membrane; the result was an ulcer of various depths. It might merely involve the submucous tissue, or reach the peritoneum and cause perforation.

Bolton found that the part played by the gastric juice in the formation of these ulcers was very important; in fact, in the absence of gastric juice, ulceration failed to appear, although the animal died from the general poisonous effects of the serum. The serum itself did not produce necrosis of the gastric cells, but brought about some change in them which rendered them susceptible to the action of the gastric juice. The process was, therefore, one of digestion of the gastric mucous membrane by the gastric secretion, owing to some change which had occurred in it. What that change was could not be determined, because no microscopic alterations could be seen in the cells before they were digested. Bolton says: "It is undoubtedly a question of the infliction of a certain amount of injury upon the cells, and necrosis and ulceration are produced merely because the cells happen to be exposed to the action of a digestive fluid." Again, "It is not necessary for organisms or their poisons in the blood stream to kill the gastric cells, but if a certain amount of damage is inflicted upon the latter, the gastric juice is then able to complete the death of the tissue and produce an ulcer. This explains why these bacterial ulcers are found so much more frequently in the stomach than in other parts of the body. The same remarks apply to the ulcers found in other intoxications of the body—as, for example, in burns. In almost half of the cases, such toxic ulcers are single, and many instances are on record of the transformation of such acute ulcers into chronic ones."

This action of poisons circulating in the blood suggested that certain substances, introduced into the cavity of the stomach, might produce a similar effect. There is one protoplasmic poison constantly present in the gastric juice, namely, hydrochloric acid. Hyperacidity alone was unable to produce ulcers, but Bolton showed that hyperacidity was potentially able to do so, and that, in the presence of another poison, a hyperacid gastric juice did more damage to the stomach wall than juice of normal acidity.

Besides determining the effect of hydrochloric acid, Bolton experi-

mented with acetic acid, or vinegar (which contained 4 per cent. of glacial acetic acid), and found that a 0.5 per cent. solution, or one of any strength above this, markedly increased the lesions produced by the gastrot toxin. Lactic acid was not so potent in this respect.

The rapidity of formation of an ulcer varied according to the activity of the gastric juice. It was found that a quantity of meat remained in the stomach four times as long as double the weight of milk. A series of experiments were conducted in which half the animals were fed on meat, and half on milk, an ulcer being produced in each by local injections of immune goats' serum. When an animal was fed on meat, the walls of the stomach were exposed to the prolonged action of the gastric juice, the slough formed rapidly, and separated by the fourth day. A clean ulcer resulted. In the animals fed on milk, the period of formation of the ulcer was longer, and the slough was still adherent on the seventh, and even on the eleventh, day. The same result was obtained in the case of fasting animals. When the stomach was empty, the ulcer did not appear at all, or, if it did, was quite superficial. Bolton therefore argued that "When all the conditions necessary for the production of ulcer are present, the rate of its formation and its extent are largely dependent upon the condition of the gastric juice. In the human being, acute ulcer is initiated in several ways, but, in all cases, the different lesions are eventually converted into the same kind of ulcer by the action of the gastric juice, so that, in most cases, it is impossible to say how the ulcer took its origin."

As to the influence of the gastric juice upon the healing of experimental ulcers, it was found that an acute one healed in about three weeks, the exact time depending upon the size of the ulcer. Further, that animals fed on acid diet passed through precisely the same stages as animals fed on a normal diet, and that the ulcers healed within the same time. Similar results were obtained where a diminution of the acidity of the stomach contents was present.

Motor insufficiency of the stomach (due to artificially produced pyloric stenosis) definitely delayed healing of the ulcer for at least twice the normal time. The delay in healing occurred during the early stages before the single layer of cells, which eventually develop into glands, had completely covered the base. "The cause of this delay was not due to a fault in the epithelium, but to necrosis of the connective-tissue base of the ulcer—so that the epithelial cells had no granulation tissue over which to grow—and also to excessive formation of fibrous tissue in the base, the young glands having no cellular stroma in which to proliferate. These conditions were due to the retention of food in the stomach, which allowed a prolonged action of the gastric juice upon the connective-tissue base of the ulcer."

For the same reason, the time of healing of an acute ulcer depended upon the quality of the food. As said before, meat was retained in

the stomach longer than milk, and it produced a greater flow of gastric juice. When the delay in the early stages of healing did not occur, the ulcer healed rapidly and when once the base was covered with a single layer of epithelial cells, it was consequently protected from the action of the gastric juice, and further changes in this layer progressed at a rapid rate. Whenever there was delayed healing, with its accompanying excessive formation of fibrous tissue due to the irritant action of the gastric juice, the glands of the regenerated mucous membrane were more irregular and not so perfectly formed as in the condition of normal healing.

Therefore, Bolton advised that, in the treatment of gastric ulcer, the acidity of the stomach should be kept low by the administration of alkalies, the diet should be free from irritants, and should consist of foodstuffs which remain only a short time in the stomach, and which excite but a moderate flow of gastric juice. When there is retention of food, which resists medical treatment, gastro-enterostomy should be performed.

GASTRITIS AND GASTRIC ULCER. Chessin¹ obtained pieces of gastric mucous membrane at the time when gastro-enterostomy was being performed for ulcer situated at some other point in the stomach. He constantly found abnormal changes in such pieces of mucous membrane. In one case only was the glandular apparatus the only abnormally changed portion of the mucous membrane. In all others there was round-cell infiltration not only of the glandular apparatus, but also of the interstitial cellular tissue. All grades of infiltration were found, from the very slightest up to microscopic ulcers. There was no relationship between the microscopic pathological condition and the condition of the pylorus, presence or absence of dilatation, etc. From this, Chessin concluded that there was no reason to consider the ulcer-producing condition to be local, but rather a general process affecting the entire gastric mucosa.

A similar investigation by Heyrovsky² also revealed the frequent existence of gastritis, not only in cases of ulcer, but also in carcinoma.

The subsequent course of the ulcer cases showed that 64 per cent. of those with healthy mucous membrane remained well, while the same held for only 46 per cent. of those with gastritis (as proved by histological examination).

LATE RESULTS IN GASTRIC ULCER TREATED BY MEDICAL MEANS ONLY are reported by Pirila³ from the medical department of the University of Helsingfors. A series of 281 cases, observed between 1890 and 1910, forms the basis of this interesting report. Of these, 13 per cent. required surgical treatment for the bleeding, pain, and

¹ Arch. f. Verdauungskr., Band xviii, Heft 4, p. 523.

² Wien. klin. Woch., 1912, No. 2.

³ Arch. f. Verdauungskr., Band xviii, Heft 3, p. 294.

other symptoms which proved intractable to medical treatment. Another group, comprising 10 per cent. of the original number, died in the hospital. It was possible to follow the subsequent course of only 120 patients. Of these, 86.7 per cent. left the hospital apparently cured. At the end of 1910, but 29 per cent. were found to be perfectly well, 35 per cent. improved, 5 per cent. unimproved, and 30 per cent. dead from some complication of their ulcer. The mortality among women (10 per cent.) was far less than among the men (39 per cent.), whereas far more women (44 per cent.) than men (22 per cent.) permanently recovered from the ulcer or its sequelæ.

There was 28 per cent. mortality among those discharged with the remark "improved," within one to two years after discharge.

Pirila states that 80 per cent. of the cases with gastric hemorrhage can be temporarily cured or improved by medical treatment, but only half of these are permanently cured. From the difference between the statistics in the men and women, he concludes that patients who lead a life devoid of very energetic exercise have a better chance of enjoying permanent health than those who must do hard work.

PYLORIC EXCLUSION. Since von Eiselsberg¹ advocated this as a routine procedure for pyloric ulcer, a number of supposed improvements have been suggested. Parlavecchio, and also Quenu, suggest tying off the pylorus with a heavy piece of silk thread. According to the recommendation of Wilms, and independently suggested by Bogoljubow, a fascial strip is made to encircle the pyloric portion of the stomach. Girard incises transversely down to the mucous membrane, and sews up longitudinally—a reverse of the Heinecke-Mikulicz pyloroplasty. A reefing method of narrowing the stomach has been suggested by Kelling and Körte.

At a surgical meeting in Frankfort, on November 16, 1912, Propping,² of Rehn's Clinic, presented a case which clearly illustrated the unreliability of some of these methods. A man, aged twenty-eight years, was found to have a duodenal ulcer. Posterior gastro-enterostomy was established, and the pylorus was excluded by tying a stout silk thread around the stomach. Soon after this the patient again had severe pain. Within three months a second laparotomy was performed. The pylorus was found open, there were a number of ulcerations around it, and the thread had cut half-way through. A plastic operation of the pylorus, as suggested by Girard, was made, together with a triple reefing suture of the prepyloric area, as recommended by Kelling and Körte. Apparent relief followed, but examination by the *x*-ray six months later revealed complete unfolding of the pylorus. Propping advocates narrowing of the lumen with a strip of fascia, as recommended by Wilms. The latter, in the discussion which followed, reported 8 successful cases of exclusion with a fascial strip.

¹ See Review in *PROGRESSIVE MEDICINE* for June, 1911, p. 112.

² *Zentralbl. f. Chir.*, 1913, p. 93.

Von Haberer¹ gives the following indications for pyloric exclusion: It should be performed when an ulcer of the pylorus cannot be resected for one reason or another, either from lack of time (weak condition of the patient), or for mechanical reasons, such as extensive adhesions to the pancreas, or liver, in which resection would be dangerous. He also warmly recommends it in the presence of duodenal ulcer, and reports 17 cases of pyloric exclusion for this condition. One case died of a perforating jejunal ulcer some time later. The original duodenal ulcer had healed perfectly.

Kehr² considers pyloric exclusion for duodenal ulcer as indispensable for a successful result.

Less important articles by Burk, Borszeky and Baron, Blad, and Pauchet all advocate pyloric exclusion.

Von Eiselsberg's method of suture after complete division is the surest. The method of Wilms is of too recent origin to furnish any definite knowledge. The other methods are of no value.

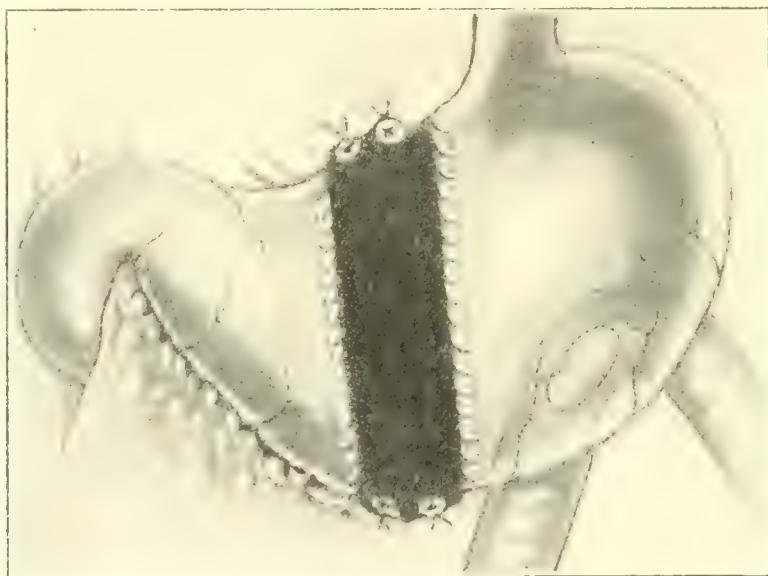


FIG. 67.—Modified partial gastrectomy completed by gastro-enterostomy. (Dobson.)

RECURRENCE OF GASTRIC ULCER. Dobson,³ in reporting a series of cases of gastric ulcer, cites 3 in which recurrence took place in the scar of the previous ulceration, and another in which the recurrence was close to the old scar. In 2 of the cases, the appendix had been removed at the first operation, and therefore could certainly have had nothing to do with the recurrence. In 3 of the cases, great care was exercised in the diet, and hence recurrence could not be attributed to the type of food. Nothing, however, is said as to whether or not constipation was present. Dobson describes an operation which he terms "modified

¹ German Surgical Congress, 1912.

² Münch. med. Woch., 1912, No. 25.

³ British Medical Journal, October 5, 1912, p. 864.

partial gastrectomy." This was successfully carried out in 4 cases. The end-results also were good. Dobson makes no reference to von Eiselsberg's pyloric exclusion, which is a very essential part of his procedure and which has been well known in the surgical world for at least two years past. (It was reviewed in *PROGRESSIVE MEDICINE* for June, 1911, p. 112.) As indicated above, the operation is an excellent one, and should be more extensively used. Fig. 24 is an illustration from Dobson's article, which explains itself.

Gastric Carcinoma. According to Zoeppritz,¹ the *constant presence of occult blood in the stool is the most reliable and most constant of the non-specific symptoms of carcinoma of the stomach.* It may be considered a relatively early symptom, because it is present at a time when the patients first come to the physician. In 110 cases of carcinoma of the stomach, this symptom was present in 94.55 per cent. A palpable tumor was present in but 63 per cent.

According to the idea of Zoeppritz, ulcer of the stomach bleeds intermittently—not constantly in small amounts. This latter is characteristic of cancer, and may explain certain cachexias from cancer as anemias secondary to the constant minute hemorrhage from the tumor's surface.

THE INVOLVEMENT OF REGIONAL LYMPHATIC GLANDS IN CARCINOMA OF THE STOMACH was investigated in 200 resected specimens by MacCarty and Blackford,² of the Mayo Clinic. Their findings bear out what is already known regarding the spread of cancer elsewhere in the body, namely, that there is no hard and fast rule regarding the respective size of primary growths and metastases. In some cases, there may be extensive secondary involvement from a small primary tumor, while, in others, a very large tumor may be well localized. In other words, all palpable tumors of the stomach are not inoperable. Indeed, many cases considered clinically inoperable have proved amenable to surgical treatment.

The *negative conclusions* of MacCarty and Blackford may be summarized as follows:

1. The size of regional lymphatic glands bears no apparent relation to the size of the primary lesion of the stomach.
2. The size of a lymphatic gland is no criterion of the presence or absence of carcinoma.
3. Gross diagnoses of lymphatic glands are of no value except in advanced carcinoma of the glands.
4. The duration of symptoms bears no apparent relation to the size and extent of involvement in the lymphatic glands.
5. The average age at operation and the sex bear no direct relation to the glandular involvement.

¹ Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxiv, Heft 3.

² Annals of Surgery, June, 1912, p. 811.

The *positive conclusions* may be summarized as follows:

1. The average loss of weight increases with the increase in extent of glandular involvement.
2. The immediate hospital postoperative mortality is in direct proportion to the amount of glandular involvement.
3. The subsequent mortality is in direct proportion to the amount of glandular involvement.
4. Carcinomatous glandular involvement is very often microscopic.
5. The surgeon who desires to treat early carcinoma must depend upon the microscope in the hands of an experienced pathologist for the recognition of early carcinomatous lymphatic involvement.
6. The diagnosis of early carcinomatous involvement requires extensive experience in the study of the so-called precarcinomatous reaction of lymphatic glands.

Gangrene of the Lung Following Resection of the Stomach or Duodenum.

In a series of 138 resections of the stomach or duodenum, Coenen¹ had eight cases of fatal postoperative gangrene of the lung. This complication was quite as frequent as fatal postoperative pneumonia. Coenen considered it questionable whether an etiological separation of the gangrenous process from pneumonia could be made. He inclined to the view that both are varieties of a similar process of lung infection. The paths of infection may be by way of the air passages, or from the abdomen by the blood stream or by the lymphatics. In one instance the invading organisms cause pneumonia, while, in others, the presence of saprophytes leads to gangrene. The prognosis is absolutely unfavorable. It might be worth while to observe whether gangrene of the lung occurs more frequently in individuals suffering from ozena or with neglected oral cavities containing carious teeth.

THE SMALL INTESTINE

The Effect of Extensive Resections of the Small Intestine is the subject of a most interesting problem discussed by Flint² in a recent number of the Johns Hopkins Bulletin. His experiments were carried out upon dogs. As a result of these, he believes that in dogs as much as 50 per cent. of the total small intestine may be removed without fatal results. The animals gradually return to a condition of practically normal weight and metabolism when maintained on a favorable diet under good conditions. Resections of 75 per cent., and even more, may be survived, but such animals are not liable to show a true recovery. In all cases, the animals suffer at first from severe diarrhea, ravenous thirst and appetite, and loss of weight, from which they gradually

¹ Deutsch. med. Woch., 1912, No. 25.

² Johns Hopkins Hospital Bulletin, May, 1912.

recover. After recovery, however, they remain extremely sensitive to unfavorable conditions of diet and living.

Metabolic studies on such animals show a marked increase in the excretion of nitrogenous, fatty, and carbohydrate elements of the food. The carbohydrates are absorbed to a degree considerably above normal after compensation is established. An increase in the amount of fats fed, may lead to increased elimination of nitrogen and fats.

In that portion of the small intestine left behind, a compensatory process is established, which consists in hypertrophy as well as hyperplasia. There is no regeneration of either the villi or crypts. By computation it was found that, in favorable cases, approximately the original epithelial area of the intestine was restored by the hypertrophic process.

Although 50 per cent. of the small intestine may be resected without much danger of serious consequences, in the majority of cases it was found that the resection of small amounts might, however, be followed by severe metabolic disturbances, and even inanition and death.

A study of the literature showed that, in human beings, the results were similar to those in animals. The metabolic disturbances bore no relation to the amount of intestine removed, and, because of this uncertainty, as small an amount as possible should be resected. The diet of such patients should be poor in fat and relatively rich in carbohydrates, and should be of a readily assimilable character.

Soresi's Method of End-to-end Intestinal Anastomosis¹ may briefly be described as follows: A short rubber tube is repeatedly pierced in such a manner (by a curved needle armed with a piece of catgut) that a series of loops of this catgut project from the outer surface of the tube and describe a circle (Fig. 68). What practically amounts to a Connell continuous mattress suture is then performed according to the method described by Willard Bartlett in the *Annals of Surgery*, October, 1910, p. 520, which was reviewed in *PROGRESSIVE MEDICINE* for June, 1911, pp. 81 and 82. After the first stitch uniting the mesenteric angles is made, and the knot tied within the lumen, the rubber tube with its series of projecting loops is inserted into the lumina of the intestinal ends. These catgut loops protrude beyond the line of union; as the mattress suture is made, that part which runs externally from one serous surface to the other, is passed under (through) the projecting catgut loops (Fig. 69). When suturing is finished, the two ends of the catgut composing these loops are pulled on. As the loops tighten and approach the surface of the rubber tube, they carry in with them the mattress suture. After being pulled taut, these catgut ends are tied and cut short, so that the knot is buried by the inverted serous surfaces.

¹ *Surgery, Gynecology, and Obstetrics*, July, 1912, p. 110.

I have repeatedly seen W. J. Mayo demonstrate the excellent qualities of the Connell continuous mattress suture in the course of a gastro-enterostomy. He would release and remove the gastro-enterostomy clamp after the first anterior suture (Connell mattress) had



FIG. 68.—Mattress stitch, insuring me-enteric angles (dead spaces). (Soresi.)

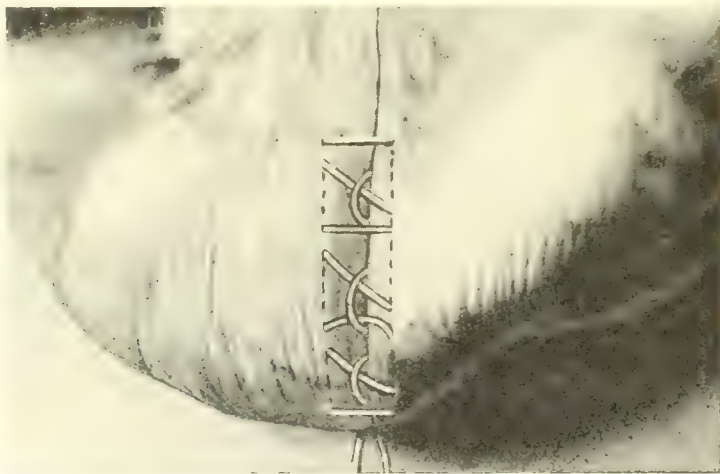


FIG. 69.—Schematic view of mattress suture. This shows that the thread passing from one segment of the gut to the other is passed through a loop; it is immaterial whether it is passed under loop once or twice. (Soresi.)

been completed, and would allow the jejunum to fill with stomach contents, a fact visible to everyone in the room. The suture line did not leak. The external serosa to serosa stitch was then completed.

Williard Bartlett, in the article referred to above, stated that he

had used a single Connell continuous mattress suture in a large number of cases with entire success. The mattress suture alone is certainly simpler than the rubber tube and the catgut loops, and is apparently quite safe.

Advantages to the Organism from Utilization of Bile and Intestinal Contents Derived from Fistulas High up in the Small Intestine, is the title of a paper by Schmilinsky,¹ which describes an excellent means of tiding over certain otherwise desperate cases until their condition has improved sufficiently to warrant attempt at a radical cure. Both of the cases described by this author are sufficiently interesting to be briefly reviewed. In the first, a resection of the stomach with gastro-enterostomy was performed for ulcer. A stormy convalescence followed. After four weeks an abscess to the right of the median line was opened. It contained bile-tinged pus. A few days later, pure bile was discharged from the wound at the rate of from 800 to 1000 c.c. per day. The stools were acholic. The patient's condition rapidly became worse; it was apparent that he could only live a few days longer. Schmilinsky saved the situation by collecting all the bile flowing from the fistula, and, by means of a stomach-tube, pouring it into the stomach twice a day (about 400 c.c. each time). For two months the patient bore the treatment excellently. At the end of this time, as the fistula did not close, an anastomosis was made between the fistula and a loop of jejunum. A cure resulted. In this instance, the patient was suffering not only from loss of fluid, but from loss of bile. Naturally, such a loss could not be made good by saline infusions or nutrient enemas.

In a similar case, Kausch² administered a mixture of bile and red wine by mouth. At the end of a week the patient absolutely refused continuation of this treatment. In all, 445 c.c. of bile were given in seven days—not enough to be of any practical value to the organism. The administration by stomach-tube is much less unpleasant, and permits the introduction of adequate quantities of bile.

The second case of Schmilinsky's was that of a boy, aged twelve years, who developed ileus after an appendicitis operation. A secondary enterostomy was done. The opened loop was situated high up in the small intestine. There was a profuse discharge of contents, including much half-digested food. Rapid loss of flesh and strength occurred in spite of a plentiful diet. Colostomy (Witzel) was made into the transverse colon close to the hepatic flexure. Material obtained from the fistula of the small intestine was thoroughly rubbed up in a small dish and then injected into the colon. Plenty of saline solution was administered in the same way. The large intestine tolerated this well. The feces were solid. They, however, contained an increased

¹ Zentralbl. f. Chir., 1912, p. 1667.

² Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1911, Band xxiii, Heft 1.

amount of fat. The patient's condition rapidly improved so that at the end of two weeks the fistula of the small intestine could be closed.

In discussing this case, Schmilinsky rightly maintains that the contents of the small intestine are more suitable for the physiological economy, and are not as irritating to the large intestine as nutrient enemas. The latter are tolerated only for a short time, and their administration is far more disagreeable to the patient than injection of the contents of the small intestine, as described above.

When colostomy is not practicable, the administration of such intestinal juice per rectum instead of nutrient enemas has been suggested by Schmilinsky, and is certainly worth trying.

Annular Stenosis of the Gut Following Incarceration. In a very complete, well-arranged paper, Hoffman¹ discusses the two types of stenosis which have been observed to follow incarceration. Both are rare, but the canal-like stenoses are more frequent than strictly annular ones. One of the latter was found in Hoffman's case. The patient was a man, aged thirty-nine years, who had suffered a severe attack of ileus at the age of ten. Since then he had never been well, and had continually suffered from cramps and erections of the gut. Two or three times a year he would have attacks of ileus. He lived principally on fluids. At operation, a localized, ring-like stenosis of the small intestine was found 40 cm. from the ileocecal valve. The gut looked as if it had been tied with a string; 7 cm. from the ileocecal valve was a band which began at one side of the mesentery, crossed the gut without constricting it, and was again attached to the other side of the mesentery. This band was removed. Resection and side-to-side anastomosis was performed. The patient made an uneventful recovery.

The specimen obtained consisted of 75 cm. of small intestine, 50 cm. of which were oral to the stenosis. There was much hypertrophy and dilatation above the stenosis, and close to the stricture was a necrotic "dehnungsgeschwür" (ulcer due to distention). The stricture was due to a deposit of scar tissue in the submucosa. Ten centimeters to the oral side of the main stenosis was a second, slight, but definite, annular constriction also due to a circular scar in the submucosa. Between the lesser and greater strictures, the gut wall showed increased connective-tissue deposit in the submucosa, and an atypical, thin mucous membrane. The primary injury apparently caused sufficient local necrosis to evoke repair by granulation tissue. Naturally, the injury was of equal severity all the way around the gut wall. The gangrene apparently started from within and proceeded outward. Histological details should be read in the original.

It was concluded that these two annular constrictions, with the intervening gut, were evidences of an incarceration which had taken place twenty-nine years before, the gut having slipped under the band described above. The strangulation had undergone spontaneous relief.

¹ Bruns, Beitr. z. klin. Chir., Band lxxxi, p. 136.

THE APPENDIX

Air inflation of the large intestine by rectum has been observed to cause localized pain in the right iliac fossa in cases of appendicitis (Bastedo¹). Dreyer² has confirmed this observation and says that the method furnishes proof of changes in the "appendix and its neighborhood." From experience with this method, Rost³ suggests that the statement of Dreyer be changed to "changes in the appendix *or* its neighborhood." He recites the history of a case in which the appendix had been removed some time before, and yet inflation of the large intestine caused pain in the right iliac fossa. The patient was a woman, aged twenty-one years, who suffered from obstinate constipation, the bowels moved once every four days. There was persistent pain in the right iliac fossa. Appendectomy gave no relief. Inflation, as just stated, caused local pain. At the second operation, the non-inflamed cecum was found enlarged and prolapsed into the pelvis. Fixation of the cecum was made according to the method of Wilms. After recovery from operation, inflation of the large intestine failed to evoke localized pain in the right iliac fossa. A pericolic membrane was present. Rost explained that the pain was caused by traction on the mesentery of the gut. Therefore, this test gives positive results, not only in local inflammation in the neighborhood of the cecum, but also when abnormal fixation of organs in this region exists. Furthermore, the method is useful in diagnosing trouble in the large gut elsewhere than the caput coli. This was demonstrated by a case in which inflation caused pain in the left lower abdomen. Operation revealed adhesions of the large intestine on the left side following old appendicular inflammation.

Rost concluded that this inflation test was not pathognomonic for appendicitis alone, but might be of use in differentiating abdominal pain due to disease of the kidney, tubes, or gall-bladder, from localized inflammation of the large intestine, provided the latter was not connected to those organs by adhesions.

The Preoperative Diagnosis of Appendicitis by a method of dorsal percussion around the sacro-iliac regions is described by Ewart.⁴ Briefly, this method consists in outlining the crests of the ilia near the sacro-iliac joints with a skin pencil, and then percussing in the region of these joints. The author states that, normally, two symmetrical patches of dulness can be demonstrated. That after successful operation, the right patch of dulness is either absent (whatever that may mean), or replaced by localized tympany corresponding to the normal

¹ St. Luke's Hospital Report, 1911, vol. iii.

² Münch. med. Woch., 1912, No. 34.

Ibid., p. 2055.

⁴ British Medical Journal, December 28, 1912, p. 1741.

area of dulness. He claims that an increase in the size of the dulness upon the right side in this region furnishes a valuable indication in appendicular disease in which anterior abdominal signs are lacking. In other words, that this method can hardly fail to detect deep-seated retrocecal abscesses.

I fully agree with the author's preliminary remark that his report is fragmentary. In this paper the details of but 11 cases are quoted, yet Ewart gives one to understand that he has been using this method for over thirteen years. The histories of the cases cited lead one to realize that although a definite retrocecal abscess may readily enough give a dull area near the right sacro-iliac region, such dulness may also be present in the absence of appendicular trouble. Space does not permit of a detailed criticism dealing with many interpretations advanced. Let it suffice that a great deal of confirmatory evidence will be required before all the assertions made, receive serious consideration by the profession at large.

Traumatic Hemorrhages of the Appendix Wall. There is no unity of opinion as to whether the minute capillary hemorrhages found in the submucous layer and in the follicles of extirpated appendices should be considered typical of acute inflammation, or should be interpreted as artefacts. Rubesch and Sugi¹ seemed to have solved this problem by their experiments upon rabbits, and by their observations upon a small number of carefully controlled appendectomies in human beings.

In rabbits, they found that the removal of healthy appendices was constantly sufficient to cause hemorrhages in the mucosa. The hemorrhages followed either pressure of the fingers or disturbance of circulation (tying of artery or vein). The hemorrhages were more marked the greater the pressure, or the longer the pressure or circulatory disturbance lasted. Simultaneous pressure (squeezing) and disturbance of circulation caused larger and more numerous hemorrhages. It was easy to cause hemorrhage at any given point by localization of trauma or circulatory disturbance.

In human beings, similar results were obtained in appendices removed from women during the course of operation upon the pelvic organs. The histories of these cases gave no hint of previous appendicular disease. At operation, the points of trauma (the site of ligature of the mesentery and the parts of the appendix subject to handling) were carefully noted. There were 9 cases. Submucous hemorrhages were found in 8; the lumen of the remaining one was completely obliterated. Only 5 were found free from inflammation in spite of the negative history which all of them gave. Excluding those which were inflamed, it was found that the hemorrhages were invariably situated just where the hand or instrument had touched. In 1 case in which

¹ Bruns, Beitr. z. klin. Chir., Band lxxx, Heft iii, S. 442.

the distal half of the lumen was obliterated, the proximal part showed hemorrhage at the site of trauma. The distal half, although its tip was seized by a hemostat, did not show hemorrhage there. In the diseased appendices, the same localization of hemorrhage was found.

The Association of Chronic Duodenal Ulcer with Morbid Conditions of the Ileum, Appendix, and Colon, is illustrated by a series of 10 cases of duodenal ulcer recently published by Wilkie.¹ All of these cases were autopsied. In only 2 of them were the symptoms clear enough to lead to the correct diagnosis during life. All, however, showed unmistakable signs of old inflammatory mischief in the lower bowel. In 5, the appendix was diseased. In the other 5, the colon showed more or less extensive pericolitis. In only one was death directly due to duodenal perforation. The details, which are most interesting, should be read in the original.

Similar observations by Rössle² were made to the effect that peptic gastroduodenal ulcer occurs so often in conjunction with other intra-abdominal illnesses that there must be some relation between them. In some, the ulcer appears as a "second illness." According to Rössle, such ulcers are not due to toxins present in the blood stream, but to local spasm due to nerve reflex of the vagus. The spasm is supposed to cause local anemia which injures the cells to such an extent that the gastric juice completes their destruction. The places of predilection are those in which the spastic contraction throwing the mucous membrane of the stomach into folds, endures the longest.

Instances of this secondary appearance of gastric ulcer are cited in cases in which the appendix has been removed, or, in fact, after any laparotomy, the theory being that a chronic ulcer may be made worse by any abdominal section under general anesthesia. As in Wilkie's series, there seems to be an inter-relationship between appendicitis and ulcer. Lastly, ulcers are known to become manifest after operations upon, or injuries of, the central nervous system or the peripheral nervous system.

These papers merely emphasize the well-known fact that coexisting intra-abdominal lesions of the alimentary tract are of frequent occurrence. Hence, manual exploration of the rest of the abdomen should invariably accompany the local operation whenever this is feasible. The worth of information so gained is shown by the most valuable statistics of the Mayos, Moynihan, and others. (See remarks on the Size of Abdominal Incisions.)

In discussing the etiology of gallstones, intestinal sand, and coproliths, Williams³ suggests that the close resemblance in chemical structure between appendix concretions and true intestinal sand, and the

¹ British Medical Journal, November 9, 1912, p. 1285.

² Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxv, Heft 4, S. 766.

³ British Medical Journal, 1912, No. 9, p. 1282.

finding of intestinal sand so commonly in cases of mucous colitis (which clinically is frequently associated with disorders of the appendix), suggests a common factor in the etiology of these two conditions. At another place in the same article, Williams quotes the remark of MacCarty, of the Mayo Clinic, from an article dealing with statistics of disturbances in the gastro-hepatic-duodeno-pancreatic system. "That the figures are sufficiently significant to keep in mind as possible evidence of the probable fact that the inflammatory process in the appendix causes disturbances in the bile passages directly or indirectly." To this Williams makes the logical rejoinder: "Is it not possible that a common factor may be at the bottom of both conditions?"

The observations just reviewed are most interesting, and should stimulate investigation of the factors leading to their production. It is by no means proved that the presence of trouble in the lower bowel is the cause of gastroduodenal ulceration, or conversely, that impaired gastric function due to ulcer is the cause of appendicitis or pericolitis, in spite of the statements made to this effect. All one can say at the present time is, not proved.

Abscesses of the Liver Following Acute Appendicitis and Their Treatment. According to Quenu and Mathieu,¹ if the abscess is unilocular, the prognosis is good. They cite 3 cases in which drainage of such solitary abscesses was followed by recovery. Eleven cases were collected from the literature; there were only 2 deaths. Most of the abscesses lay in the right lobe of the liver near its upper convex surface.

A Queer Method of Suicide is reported in a monograph by F. Colley.² A doctor who was tired of life took advantage of an attack of appendicitis to aggravate conditions by energetic local massage. His effort was successful.

THE LARGE INTESTINE

The Surgical Treatment of Constipation has been given more attention than ever during the past year. In many articles dealing with this subject, the phrase "after exhausting all medical means," introduces the particular author's favorite treatment of visceroptosis, Jackson's membrane, and Lane's kink. The perfunctory way in which the diagnosis seems to have been made, and the still more perfunctory mention of all non-operative means, causes the following questions to arise: Was the cause and site of the delay of intestinal contents (actual stenosis or aberration of normal function) determined by the x-ray in competent hands? Was the advice regarding rest, diet, and exercise made to fit the individual case? Or, taking this for granted, was such advice properly followed, long enough to give the treatment a fair trial?

¹ *Revue de Chir.*, xxxi, Année No. 10.

² Reviewed in the *Zentralbl. f. Chir.*, 1912, p. 717.

Without a proper diagnosis, naturally there can be no proper treatment. Before condemning the colon as a cesspool of bacterial stagnation whose products poison the entire body, and before advising extirpation or exclusion of this source of poisons, let us first determine the normal functions of the large intestine; then observe how diet and drugs modify these, and lastly, consider different types of constipation, some of which are purely functional aberrations, while others arise from relative stenosis due to kinks or bands, with or without ptosis.

NORMAL FUNCTION OF THE LARGE INTESTINE. Unquestionably, the very best article of the past year regarding the functions of the large intestine has been written by W. B. Cannon, the well-known American physiologist. It appeared in the *Journal of the American Medical Association* for July 6, 1912. It would be well for anyone interested in the subject of colonic stasis to read and re-read every word of Cannon's paper. I regret that space does not permit reproduction of this article *in toto*. Only the main facts will be given here.

The small intestine is that portion of the alimentary canal in which the final processes of normal digestion occur, and in which almost all of the digested food is absorbed.

The large intestine serves as a reservoir to receive, store, and periodically discharge the accumulation of waste. The material delivered to the colon is still semifluid. In the cecum and ascending colon the stagnant mixture of indigestible matter, food, cellulose, water, and bacteria, presents an ideal condition for putrefactive and fermentative decomposition. In the first part of the large intestine, the last of the food disappears, and the water content begins to be reduced. The absorption of water causes the consistency of the waste to be gradually more dense. While the content of the cecum and ascending colon is soft and mushy, the content of the transverse colon may be found as firm as that which is discharged through the rectum. *This difference in consistency of the material in the proximal and in the distal colon corresponds to a difference in the motor activity in these two regions.*

Antiperistalsis (anastalsis) appears, in the main, along the cecum, ascending, and proximal transverse colon, but may appear in any portion of the large intestine. It has been observed that the anastaltic waves start in the cat at the tonically constricted ring nearest the cecum. Furthermore, they can be started in the inactive intestine by making a tonic ring. Therefore, the tonic ring is of prime importance in originating anastalsis. In human beings, Boehm has recently described cases in which the x-rays have revealed a narrowing of the transverse colon usually situated at the right of the midline, with undivided contents between it and the cecum, and with permanently segmented masses between it and the sigmoid flexure. This narrow

place is similar to the first tonic ring observed in cats, which serves as a source of anastaltic waves. Injection of the human colon under these conditions might provoke these waves.¹

The kneading or mixing contractions of the colonic walls are especially notable when sacculi or haustra are well developed. From these observations, the deduction is drawn that whether the predominant movements of the proximal colon are extensive contractions shifting the mass of contents rhythmically forward and back (pendulum movements), or whether they are gentle compressions of the contents of the sacculi (haustral churnings), the effect in either case consists in a thorough mixing and overturning of the material in this region, and an exposure of the semifluid mass to the absorbing mucosa. Therefore, the first portion of the large intestine should be regarded as a place in which digestion and absorption still continue.

The distal colon may be considered as beginning near the middle of the transverse portion. It normally contains firm, formed masses of waste material. In this region, the characteristic activity of the intestinal wall is an onward moving wave, or diastalsis (peristalsis of the German authors). There is some evidence that difference in the direction of waves is dependent upon the consistency of the contents. Thus, in the rat, the proximal colon is the seat of anastaltic waves if the contents are soft and moist, but exhibits the diastaltic reflex if the material is stiff and dry.

Two modes of advancing the contents of the distal colon have been observed in man. In one, there is an onward movement of the contents of one section of the colon into an empty distal section by a sudden push lasting only a few seconds. The haustral segmentation disappears just before the advancement begins, but reappears at once when the material becomes settled in its new position. This observation suggests that the function of the haustra, whether in the distal or proximal colon, is that of increasing the surface for absorption and not that of propelling the fecal matter.

The second method of propelling contents in the distal colon is shown by the separation of a small piece of material, the size of the thumb, from the mass in the transverse colon. This piece is pushed slowly to, and around, the splenic flexure, and then down the descending colon. Three or four similar masses may follow the first, each new one starting as its predecessor comes to a stop. Thus it can be seen

¹ The anatomical studies of Rost (Deutsch. Gesellschaft f. Chir., April, 1912) are of interest in this connection. He found that the same amount of muscle is present in all parts of the large intestine, but that its tone is less in the cecum than in the lower parts of the colon. At the junction of the ascending and transverse colon, a muscular valve was constantly present, and in the mesocolon there were islands of smooth muscle. From these findings, he argued that the difference in the *character* of muscular movements accounted for the varied distribution of contents in the large intestine.

how large accumulations of material or small fragments are transmitted toward the rectum.

A superficial wave of contraction has been seen along the transverse colon, and it has been suggested that this might be the method by which intestinal gases are carried from the proximal to the terminal section of the intestine. Since the fermentative processes in the cecum and ascending portion would be likely to produce a considerable amount of gas in this region, a means of rapidly carrying it away is obviously advantageous. It is suggested that a similar rapid transport of material probably occurs when the irritant products of putrefaction result in diarrhea.

At defecation, a relatively long column of feces is passed out at one time. The entire large intestine below the splenic flexure is normally evacuated at a single act. It has even been recorded that the colon can clear itself from the ascending portion onward. The soft character of the final portion of a large fecal discharge would thus be accounted for. The remnant left in the ascending colon is within a short time spread along the colon even to the end.

According to Hertz, the waste material accumulating in the distal colon in man normally stops at the junction of the pelvic colon and the rectum, where an acute angle offers some obstruction to progress; then, from below upward, the pelvic colon fills, and, if more material arrives, it gathers in the iliac and descending portions.

On becoming distended, the pelvic colon rises, and widens its acute angle with the rectum, thus removing the obstruction to the advancement of fecal matter. Some of this matter now enters the rectum and leads to the desire to defecate. During straining the intra-abdominal pressure may be four to eight times the normal, *i. e.*, between 100 and 200 mm. of mercury. This pressure causes more feces to enter and distend the rectum and anal canal. The distention of these parts arouses reflexes which start strong diastaltic contractions of the colon, continues the tendency to strain with the voluntary muscles, and produces relaxation of both anal sphincters.

The interval between the taking of a meal and the excretion of its residue may vary, when the bowels are opened regularly once a day, between nine and thirty-two hours—depending on the time of eating and the time of defecation.

Regarding the innervation of the large intestine, it is stated that, like the stomach and small intestine, there is a double nerve supply from the central nervous system—a tonic or motor supply through the sacral visceral nerves, and an inhibitory supply from the lumbar cord through the sympathetic system by way of the inferior mesenteric ganglion. The regions of anastalsis do not receive motor impulses.

The views of Arthur Keith, the eminent English anatomist, are similar to those of Cannon. In a recent article, Keith¹ discusses the

¹ British Medical Journal, December 7, 1912, p. 1599.

comparative anatomy and physiology of the digestive tract, giving special attention to the large intestine.

After briefly stating the opinion of Lane, Metchnikoff, and Barclay Smith, all of who consider the large intestine as an unnecessary cesspool, the products of whose stagnation poison the entire body, Keith says, that if these statements are well-founded—that is, if the great bowel is as useless and injurious as is said—then medical men are face to face with a condition which threatens the health and survival of modern civilized races. Before assigning so large a part of man's digestive tract to the list of the useless structures, it would be well to inquire regarding the function of the great bowel as a whole, and the uses of its parts in the various members of the animal kingdom. Such an inquiry brings home to us that our knowledge of the function and significance of the great bowel is vague and unsatisfactory. John Hunter recognized that the cecum was small and the colon short, in in carnivora, while the opposite was the case in herbivora. Further, that animals with perfect gastric digestion had comparatively small ceca, while in those with imperfect gastric digestion, the ceca were large. In short, that there could be an interchange of function between stomach and cecum. Keith approves of Barclay Smith's assumption that all the digestive changes of food within the great bowel are due, not to any digestive secretion, but to the action of bacteria which find a permanent abode in the cecum and colon, and that the purpose of the ileocecal valve is to prevent the contents of the cecum and colon which are undergoing bacterial digestion, from being forced by the antiperistaltic movements into the ileum, where a totally different digestion is in progress. Keith, however, disagrees with Barclay Smith's further assumption that modern diet needs no bacterial action for its full digestion and assimilation, and that, therefore, the large intestine is a useless and injurious structure in the economy of modern man. Instead of practising excision in the effort to adapt our digestive tract to our present dietary, Keith suggests that we may discover a diet which will be suited to our present digestive tract, and, in order to do so, we must know something of the normal processes of digestion of vertebrate animals in general.

A brief comparative anatomical *resume* follows, in the course of which it is stated that there are three functional divisions of the mammalian cecum: (1) The cecal colon, which lies above or beyond the ileocecal orifice; (2) the cecum proper, which lies below the ileocecal orifice and arises as a diverticulum from the cecal colon; and (3) the apical or appendicular part, which is characterized by its narrow lumen and thicker walls. The same three divisions are to be recognized in the human ileocecal region—cecal colon, cecum, and appendix (Fig. 70). Keith's comparison of the function and anatomy of this region in the rat and in the human being, is most interesting.

He says: "In the rat's cecum there is a distinct sphincteric ring (cecal sphincter) at the junction of the cecum and cecal colon. In the human cecum, this sphincteric ring (cecal sphincter) is permanently united with the ileocecal orifice, and forms the well-known retinacular bands (Fig. 70). The action of the cecal sphincter can be studied in the rat (Fig. 71). At one minute (Fig. 71, *A*) the ileocecal orifice is

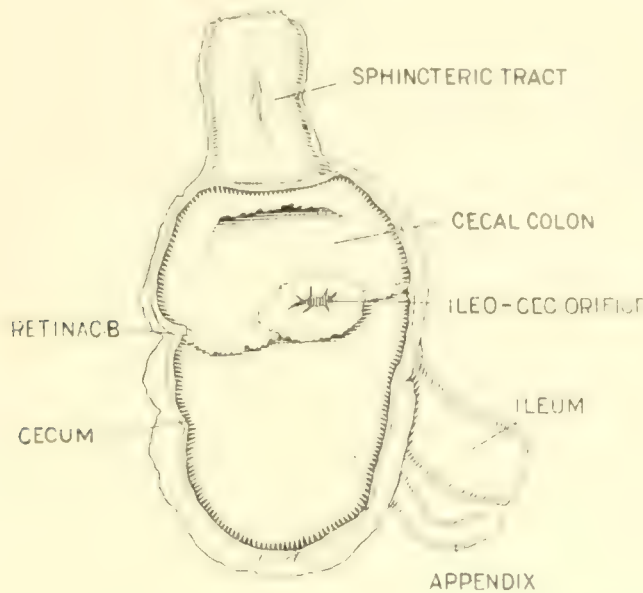


FIG. 70.—The human cecum laid open to show the ileocecal orifice, the retinacular bands, the cecal colon, and cecocolic sphincteric tract. One-third natural size. (Keith.)

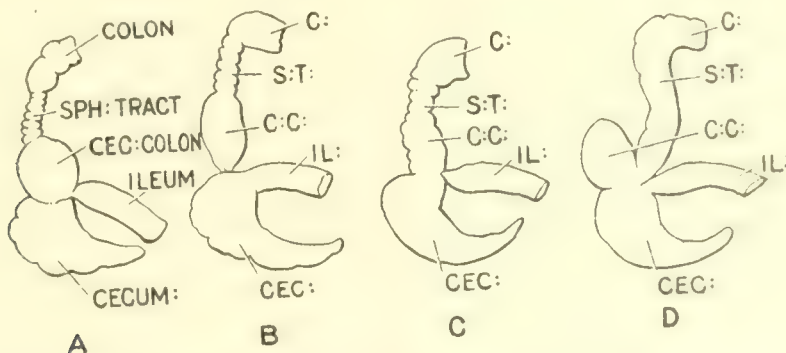


FIG. 71.—Figures illustrating four functional states of the ileocecal region of the bowel of rats. In *A* and *C* the ileocecal sphincter is closed; in *B* and *D* it is relaxed. In *A* and *B* the sphincteric tract is closed; in *C* and *D* it is open. Various conditions of the cecocolic sphincter are shown in *A*, *B*, *C*, and *D*. (Keith.)

closed, and the cecal sphincter dilated; at another, this sphincter is in action (Fig. 71, *B*), and the ileum opens directly into the cecum. Other states are represented in Fig. 71, *C* and *D*. As yet, we know nothing of the action of the retinacular bands of the human cecum, but, from what we know of their action in other animals, we may safely infer that during cecal digestion they can regulate the passage of the colonic and ileac contents to and from the cecum."

The cecal colic sphincteric tract, corresponding to the commencement of the ascending colon in man, is differentiated from the cecum below and the rest of the colon above by the degree to which its circular muscular tube is contracted. Keith regards this as the functional sphincter of the cecal colon. He concedes that the existence of this sphincteric tract in man has not been observed in *x*-ray pictures, or at operation or post-mortem, but states that the ascending colon always bends downward in front of the cecal-colic junction, and thus prevents a clear image of this tract, whereas, at operation or post-mortem, the intestines are flaccid. Moreover, he states that if, in young and healthy subjects, formalin be injected by the arterial system before putrefaction has destroyed the vitality of the musculature of the bowel, this tract will be seen. It is impossible to decompress gas from the cecum of the living; *the cecum always contains gas*; that is a necessary co-relative of the process of digestion going on within it. The gas is locked up in the cecum just as it is in the cardiac part of the stomach; it cannot be pressed into the ileum because of the ileocecal sphincter; it cannot be pressed along the ascending colon because of the sphincteric nature of the muscular walls at the commencement of the ascending colon.

In certain animals, the cecal-colon is found acting as a selective mechanism, and the ceca are set aside as separate chambers for a special and apparently bacterial process of digestion and absorption.

At no time does the cecum of any animal become completely emptied. It is well known that, in animals which die of starvation, the cecum and adjacent part of the ascending colon retain their normal contents. This is interpreted as meaning that if the digestive processes undergone by food in the cecum and great bowel are due to bacterial action, it is absolutely necessary that a certain amount of cecal contents be preserved to secure the continuation of bacterial digestion. The observations made by Elliot and Barclay Smith, bearing on the mechanism which secures retention of the cecal residue, are then referred to. In carnivores, such as the cat, ferret, and dog, stimulation of the sacral-visceral nerves causes a constriction and emptying of the great gut from the cecum to the rectum. In vegetable-eating animals, the effect extends to only the distal part of the colon; the proximal part of the colon—corresponding to the cecum, ascending colon, and hepatic part of the transverse colon of man—are outside the influence of this emptying mechanism. Holz knecht and A. E. Barclay have observed the peculiar expulsive movements in the splenic part of the transverse colon. It is known that expulsive movements occur in the colon at and distal to the splenic flexure, consequently, according to Keith, it may be inferred that “the preservation of part of the cecal and colic contents is essential for the digestive economy of vegetable-feeding mammals, and if we admit that the digestive processes of the cecum

and colon result from the action of certain bacteria, we see why nature has placed the proximal part of the colon outside of the influence of the expulsive mechanism. In the proximal part of the colon, antiperistaltic or retaining movements are observed, never the movements of complete expulsion. For the same reason, we explain the absence of the great bowel in all forms of fishes; the differentiation of the bowel into small and great intestine appears with the evolution of land-living, air-breathing vertebrates. A bacterial form of digestion, necessarily attended by the production of gas within the bowel, would upset the stability of gill-breathing, free-swimming forms. The digestive juices of fishes are notoriously strong. From the point of view of comparative anatomy, we must regard the great bowel as a part which has been elaborately modified and evolved, through the course of long ages, for a highly peculiar form of digestion."

Keith's remarks regarding the vestigial nature of the appendix are so reasonable and so interesting that they deserve repetition here: "For many years the appendix has been regarded as one of the vestigial structures of man's body, an opinion which has prejudiced us against any real endeavor to discover its actual nature and function. That the appendix should be regarded as a specialized part of the cecum is the conclusion which every one must reach who makes an impartial survey of our knowledge of the comparative anatomy and of the evolution of the human ileocecal region. In three separate orders of mammals at least the apical part of the cecum has become specialized and demarcated from the rest of the cecum in the form of an appendix. It has never been suggested that the appendix of the wombat, rabbit, lemur, or of the anthropoid apes is a vestigial structure. So similar are the ceca and the appendix of the gorilla and the chimpanzee to the same structures in man, that I know of no character by which an expert could tell the one from the other. In the anthropoids, as in man, the cecum and appendix undergo the same peculiar changes in passing from infancy to adult age. We know from their fossil remains that the great anthropoids are of extreme geological antiquity; were their appendices injurious or vestigial structures, there has been ample time to accomplish their complete suppression." The citation of the caliber of the appendix as evidence of its retrograde character is controverted. Keith says: "It is more in keeping with what we know of animal structures to regard the smallness of caliber as an adaptation to a peculiar but unknown function. We do not suppose the esophagus to be a retrograde organ because it is narrow as compared with the stomach; we fortunately know the function of the gullet."

The probable cause of appendicitis and chronic colitis are explained as follows: "Everyone who is acquainted with the more recent developments of our knowledge of the surgery and pathology of the abdomen agrees that, in a large proportion of civilized men and women,

the great bowel—especially the cecum and appendix—is abnormally liable to derangement and disease, but as to the cause of that condition, there is a diversity of opinion. No observations of recent years throw more light on appendicitis than those which Weinberg made on chimpanzees dying in captivity. We have seen that the cecum and appendix have the same form in the chimpanzee as in man. In 10 out of 61 chimpanzees appendicitis was found at death. We have no reason to suppose that in its natural habitat this anthropoid is specially liable to appendicitis—the evidence is purely negative; but as soon as the chimpanzee comes into captivity, and is placed on a human diet and exposed to human contagion, it becomes subject to a prevalent human disease. In the chimpanzee's case, we blame the diet. Metchnikoff and Barclay Smith, as far as man is concerned, regard the appendix as at fault. When we think of how the diet of highly civilized races has changed—in quality, quantity, and character—in comparatively recent times, one must marvel that our organization, which was evolved to deal with a more primitive and more precarious supply of food, has accommodated itself to modern conditions so well as it has. We know that beyond the neolithic period, when cereals began to be cultivated, some six thousand years ago, there lies a vast hinterland of rude human existence, when man must have lived on the natural products of the country. With the discovery of fire and of the artificial preparation of food (we know that man had discovered the use of fire before the end of the Pleiocene period), the task of the alimentary system must have been greatly altered. The greatest changes, however, are those of more recent centuries—the concentrated nature of food, its plentiful supply, its highly artificial character. When we come to realize how slowly evolutionary processes have affected man's body in past times, we can hardly expect our internal digestive system to adapt itself to the rapid pace demanded by the ever-accumulating resources of civilization. The modern changes we see at work in our teeth and jaws have set in since neolithic times; we have every reason to suppose that these are allied to, and contemporaneous with, changes affecting the whole alimentary system.

“Thus an impartial survey of the evidence at present at the disposal of the anatomists, indicates very plainly that we cannot hope to prevent or cure the ailments to which the great bowel is liable so long as we regard it as a hopelessly injurious or useless structure. On the other hand, if we regard it as having all the anatomical appearances of a useful structure, our outlook becomes hopeful if we can discover what its uses are. If we only knew how to keep it suitably and profitably employed by altering our diet to meet its requirements, it will, we have every reason to think, serve us and future generations just as well as it answered the digestive needs of primitive and successful races in the past.”

ANOTHER VALUABLE ADDITION TO OUR KNOWLEDGE OF PERISTALSIS AND ANTIPERISTALSIS OF THE LARGE INTESTINE is contributed by OTTO ROITH,¹ whose previous publications² on the functions of the large intestine have attracted universal notice. The material for the present paper consists in clinical observations upon 22 cases; only 1 of these was *x*-rayed. This work is most creditable and shows what good clinical observation alone can accomplish. Roith attempted to answer the question of how long material remains in the individual portions of the large intestine.

Observations on Peristalsis. There were 5 cases of fistula of the ascending colon. Feces began to escape from two to four hours after eating; this flow lasted from ten to sixteen hours after eating, and then stopped. The mode of escape was steady, and offered no hint regarding the type of peristalsis present.

There were 2 cases of fecal fistula at the centre of the transverse colon. One of these was observed for more than a year. A transverse division of the gut had been made, and both ends had been sewed to the skin. The prolapsed mucous membrane offered a certain amount of resistance. There were evacuations once, twice, or, at the most, three times during the twenty-four hours. They usually came on about the same hour each day and lasted only for a short time. They were of semisolid character.

In 5 cases of sigmoid colostomy the same results were obtained as in the transverse colon, namely, one to two daily movements of semisolid material occurring at the same hour each day, and of short duration. These patients were observed during a period of one and one-half years.

From all his observations Roith reasoned that the speed of passage of intestinal contents varied according to the different divisions of the large intestine in which they happened to lie. This difference in rate might be ascribed to (1) difference in driving power (either muscular force or the effect of gravity); or to (2) mechanical hindrances to the progress of the contents toward the anus.

Roith has changed his opinion regarding the effect of mechanical hindrances at the flexures, especially the splenic, to the obstructing influence of which he formerly gave undue prominence. From his more recent observations, he believes that neither mechanical obstruction nor the weight of intestinal contents nor the differences in muscular power of the intestinal wall account for the long duration of contents in the ascending and transverse colon, with their to-and-fro movement there, and the relatively short duration of contents in the distal colon where the material usually lies still and is moved only by

¹ Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxv, Heft 1, S. 203.

² Anat., 1902, Band i and ii, Heft 20; also Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xix.

sudden expulsive efforts which empty the bowel from the splenic flexure downward in a very few minutes.

The difference in degree of the driving power may be quantitative or qualitative. The tone of the musculature, which is weakest at the cecum, steadily increases toward the anus.¹ This, however, does not account for the observed difference in progress. The normal long duration of contents in the proximal part of the colon (cecum, ascending, and the right half of the transverse colon) is due either to lack of peristalsis, or to antiperistalsis, which constantly returns the material in an oral direction. In the distal half of the colon (distal half of the transverse colon, descending colon, sigmoid, and rectum), the contents are moved by large peristaltic waves which occur at infrequent intervals and which transport material a long distance.

An obvious fact about which little has been said in the majority of articles upon the functions of the large intestine, is mentioned by Roith, namely, that the weight of contents can have little effect upon progress, since the specific gravity of all abdominal organs and their contents (feces, fluid, etc.) is practically the same; further, that the gas present always remains at the uppermost part of the abdomen; this naturally varies according to whether the patient is lying or standing.

Observations on Antiperistalsis. In 3 cases of anastomosis of the ileum with the colon close to the hepatic flexure, transportation of contents into the oral segment of the gut was noted. In one of them, a cecal fistula of a year's standing persisted after implantation of the ileum 20 cm. distal to the fistula, but closed spontaneously after a second implantation of the ileum into the distal half of the transverse colon. In 2 other cases, fecal fistulæ of the stump of the colon came on after resection of the cecum and implantation of the ileum 10 cm. beyond the point of resection. Consequently, in all subsequent exclusions of the ascending colon (9 cases), the anastomosis was made between the ileum and the left half of the transverse colon and a retrograde leak of contents was never observed, even when (in 2 cases) the stump of the ascending colon was left open with a drainage-tube sewed into it. From this, Roith concludes that between the hepatic flexure of the colon and the middle of the transverse colon there lies a zone in which the peristalsis of the colon undergoes a change. Proximal to it, the muscle and nerve mechanism react to the mechanical stimulation of contents in a double way, both peristaltically and antiperistaltically, while distal to this zone the stimulation is responded to in only one way—peristaltically (analward). Roith was not able to observe in man a process seen in certain animals in which small amounts of material were extruded from time to time from the proximal into the distal half of the colon.

¹ This is in accord with the findings of Roith mentioned above.

Two further cases affording examples of antiperistalsis were reported. In one, a fecal fistula of the left part of the transverse colon had been made. The gut had been divided transversely, with both ends sewed to the skin. Irrigation of the distal portion of the colon, either from above or below, caused peristalsis in the proximal part (which was completely separated from it), as shown by spasmodic retraction of the upper mucous membrane and prolapse of the lower, accompanied by expulsions of a small amount of intestinal secretion. The regular recurrence of this phenomenon was observed for months.

The second case was one of resection of 15 cm. of the sigmoid with implantation of the divided ends into the same wound, 5 cm. apart. Bismuth mixture injected into the rectum ran out upon the skin and covered the opening of the proximal gut. A skiagraph taken shortly afterward showed bismuth not only in the distal part of the intestine, but also in the descending and transverse colon. This finding was confirmed, twelve hours later, by the discharge of a stool containing plenty of bismuth from the proximal part of the colon. Roith believes the only explanation possible, is that an antiperistaltic wave in the proximal part was elicited by stimulation of the distal, wholly separated part, and that this antiperistalsis sufficed to aspirate the bismuth mixture overlying the opening of the gut in the skin, and also to transport it upward and to mix it with the intestinal contents. The possibility of any appreciable amount of bismuth running into the upper segment by gravity, without the aid of antiperistalsis, was excluded.

These observations showed that an antiperistaltic movement up to, and even beyond, the middle of the transverse colon can be evoked by enemas injected (either from above or from below), into the completely separated rectal part of the gut. Inasmuch as the two parts of the gut were completely separated in these examples, the response of the upper segment could only be due to transmission of the reflex by means of nerves lying outside of the intestinal wall. Roith gives three possibilities regarding the path of these reflexes:

1. The impulse travels along the wall of the peripheral segment of the gut up to the point of section (post-ganglionic axone reflex), from there outside of the wall (preganglionic axone reflex).

2. The reflex travels entirely outside the gut wall as a preganglionic axone reflex.

3. Both mechanisms may be active along the same stretches.

The observations of Anschütz, Kreuter, and Roith regarding *gangrene of the cecum*, in patients with obstructing tumors of the sigmoid, are of significance in this connection. It frequently was found that the proximal part of the large intestine near the tumor was entirely empty, whereas the cecum was enormously distended, sufficiently so to even cause gangrene of its walls. This condition could not be explained by

simple obstruction, else the fecal masses would have reached down to the point of obstruction. The condition must, therefore, have been due to antiperistalsis evoked by the presence of the tumor.

Further examples of antiperistalsis adduced were when enemas containing lycopodium were given at least one hour before appendectomy, and when the lycopodium was found in the cecum at operation; further, the administration of colored enemas in cases of cecal fistula and the subsequent appearance of the colored fluid at the fistulous opening. Finally, the frequently observed retrograde filling of the large intestine after ileosigmoidostomy was cited as practical evidence of antiperistalsis.

From all these data, it was inferred that administration of an enema constitutes not only a washing out of the gut, but also causes stimulation of the entire large intestine, the impulse being carried by nervous paths running both within and alongside the intestinal wall.

The observations of L. R. Miller, quoted by Roith, show that, in addition to the purely reflex reaction to various degrees of distention of the hollow organs of the body having smooth muscle walls, there is also conscious control, which may cause a reversal of the reflex mechanism. For example, the withholding of stool is brought about, not by merely a local increased tightening of the anal sphincter, but through control of voluntary muscles (levator ani and sphincter ani), a nervous impulse is evoked which results in a reversed peristalsis; this carries the contents upward away from the levator and sphincter, and thereby relieves them of part of their strain (see further substantiation of this statement under Hypokinetic and Dyskinetic Obstipation below). In short, this is a voluntary inhibition of reflex action by an indirect route.

Roith concludes that normally there is both peristalsis and antiperistalsis in the region comprising the cecum, ascending colon, and right half of the transverse colon; peristalsis only in the left half of the transverse colon and descending colon, and, again, both peristalsis and antiperistalsis in the sigmoid and rectum.

The *influence of coarse and bland forms of diet upon intestinal peristalsis* has been studied by Kretchmer¹ with the aid of the *x-ray*. He found that the chief variations in function from changes in diet occurred in the small intestine and upper colon.

The *influence of various cathartic drugs upon the functions of the large intestine* have been accurately observed in the interesting *x-ray* studies of Meyer-Betz and Gebhardt.² This subject really belongs to the department of therapeutics, but it is of interest to note that senna, aloes, and physostigmine exaggerate haustral segmentation. Physos-

¹ Münch. med. Woch., 1912, No. 43, p. 2334.

² Ibid., Nos. 33 and 34, pp. 1793 and 1861; *ibid.*, No. 50, p. 2715.

tigmine first increases peristalsis, later causes tonic spasms of the pylorus, and spasm of the the large intestine, especially of the haustra.

ABNORMAL FUNCTION. Constipation. Recent important articles on constipation will briefly be touched upon to convey an idea of how fragmentary is the state of our present knowledge on the subject. Constipation may be due to any of a multitude of causes, either local in the colon itself, or secondary to some other condition. Regarding this, Cannon¹ says: "Inasmuch as defecation is a reflex initiated by the presence of feces in the rectum, it is a matter of much practical importance to note that the rectal mucosa soon becomes adapted to the presence of a fecal accumulation, and then fails either to induce the desire to defecate, or to initiate reflex contraction of the colon. If the call to defecation is not promptly obeyed, it ceases to be given, and the feces stagnate in the rectum. The stagnation of feces in the rectum is only one of the ways in which passage of material through the alimentary canal may be delayed. In other forms of constipation, there may be delay somewhere in the long course the food takes, because of inefficient motility, as in states of general atony, in depressive emotions, and in reflex inhibitions of intestinal movements. In still other cases, the delay may be due to obstruction of various sorts."

In England, Hertz² has reached conclusions which agree in a general way with those of many Continental observers. He divides constipation into two classes. In one, the passage of material through the intestines is delayed. When material has reached the pelvis, defecation is normal. In the other class, there is no delay on arrival of material in the pelvic colon, but the final expulsion is not adequately performed. This latter condition he has called *dyschezia*.

Treatment of the first type of constipation consists in appropriate diet, abdominal massage, and laxatives. *Dyschezia* should be corrected by attention to hygiene of the bowels and reëducation of the defecation reflex by administration of graduated enemas. (Compare this treatment with that employed by von Noorden, which is mentioned a little farther on.)

An excellent illustration of the *secondary symptoms following dyschezia* was shown in the case of a girl, aged eight years, who had suffered for four years with repeated attacks of pain, tenderness, and vomiting, accompanied by fever. The condition was diagnosed as appendicitis, and the appendix had been removed a year and one-half previously. The patient's condition was not improved, for five more attacks occurred after removal of the appendix. X-ray examination (after the colon had been emptied) showed that there was no delay until the rectum had been reached. The *dyschezia* had not only caused fecal retention in the pelvic colon, but also stagnation in the

¹ Journal of the American Medical Association, July 6, 1912.

² British Journal of Children's Diseases, April, 1912, p. 145.

higher parts of the large intestine, this had led to attacks of catarrhal colitis which had been mistaken for appendicitis.

The studies of Schwarz¹ not only bear out the conclusions of Hertz, but go a step farther in the classification. Schwarz recognizes

Hypokinetic and Dyskinetic Types of Obstipation. The following x-ray picture is typical for a normal individual with regular daily evacuation at a given time. At the end of twenty-four hours, in the pelvis there is a rounded, irregular mass the size of a man's fist or a child's head—this comprises the filled rectum and sigmoid, and, for the sake of brevity, is called "the globus pelvicius." The rest of the colon is irregularly filled with scattered masses of material of lesser density than is found in the pelvis. The pictures which are observed in chronically constipated people show a sharp contrast when compared to the normal picture just described above, and these abnormal conditions are found to separate into two groups: (1) In one group the globus pelvicius is not formed, even after forty-eight hours. The fecal material forms a solid column of unusual length. The colon itself shows abnormal lengthening and tendency to loop formation (hypokinetic obstipation). (2) A second group shows that the globus pelvicius is formed at the end of forty-eight hours, but that there is undue segmentation of contents or that the retrograde transport of contents is greatly exaggerated (dyskinetic obstipation).

1. The *hypokinetic obstipation* consists in a diminution of the motor function of the distal parts of the colon. This may go so far that at the end of twenty-four hours merely the cecum and ascending colon are seen to be filled. However, *there is no widening of the lumen of the colon, consequently no atony.* The characteristic continuous column of fecal material shows that the physiological segmentation of contents does not take place.

2. *Dyskinetic obstipation* is defined as a pathological accentuation of those movements which normally hinder the progress of intestinal contents toward the anus. These elements are: (a) The segmentation movements of the haustra; (b) the retrograde movements (antiperistalsis). The form of obstipation present can be termed either hypersegmentation or hyper-repulsion, according to which of these functions is more exaggerated.

(a) If the group, showing *hyper-segmentation* be compared with a normal picture, it will be seen that the material in the transverse colon is divided into many small masses, and that these rounded particles travel one by one toward the pelvis and gradually collect to form the globus pelvicius. At the same time, there is an undue retention of material in the cecum and ascending colon, and a striking emptiness of the rest of the colon—a condition described by Stierlin as the

¹ Münch. med. Woch., 1912, p. 2153.

ascendens type of obstipation. In short, there is an abnormally strong segmentation movement of the transverse colon. Fig. 72 shows this type of obstipation observed in a patient forty-eight hours after the taking of a bismuth meal. Undue segmentation causes more absorption of fluid than is normal. The small dry particles which gather in the pelvis within the usual time (at the end of twenty-four hours) do not evoke the usual inclination to stool because they lack the irritating chemical substances normally present (which have already been absorbed), and because of their dry character. The cause of this type of constipation is therefore not to be found in proctogenous changes, but in exaggerated segmentary activity and consequent undue absorption higher up in the colon.

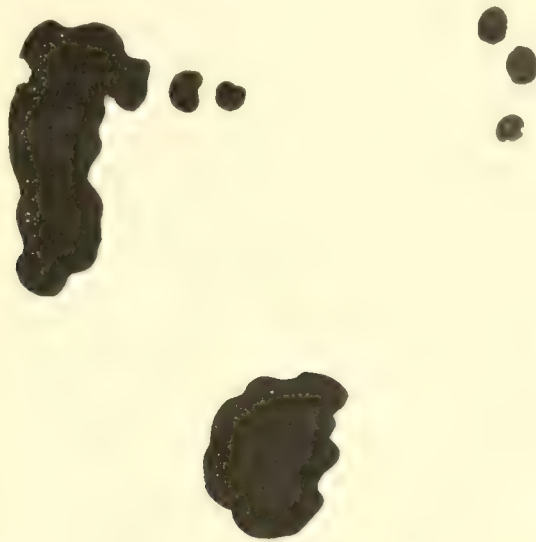


FIG. 72.—Dyskinetic obstipation (hypersegmentation forty-eight hours after bismuth meal) Cecum and ascending colon still contains much material; a few isolated particles in upper part of descending colon; globus pelvici augmented. (Schwarz.)

2. *Hyper-repulsion*. It is known that moderate antiperistalsis occurs in normal individuals. A short account of a case observed by Schwarz is a far more convincing demonstration of hyper-repulsion than a simple statement regarding the existence of such a condition.

A girl, aged nineteen years, was accustomed to go as long as five days without a movement of the bowels. A bismuth meal was given at ten o'clock one day. Twenty-four hours later the cecum, ascending and right half of the transverse colon were found filled. There was a moderate globus pelvici (Fig. 73, A). At four o'clock that afternoon (after thirty hours) *the globus pelvici had vanished*, and there were four large masses lying in the lower part of the descending colon (Fig. 73, B). At ten o'clock the second day (forty-eight hours) the cecum and ascending colon were not as strongly filled as the day before. The transverse colon contained material; the globus pelvici was the size

of a child's head (Fig. 74, *A*). At four o'clock that afternoon (fifty-four hours) the cecum, ascending and transverse colon showed little change. The globus pelvici had again broken up, and had filled the descending colon up to the splenic flexure (Fig. 74, *B*). In this case, the globus pelvici once formed did not remain so, but was pushed back into the proximal portions by powerful retrograde contractions.

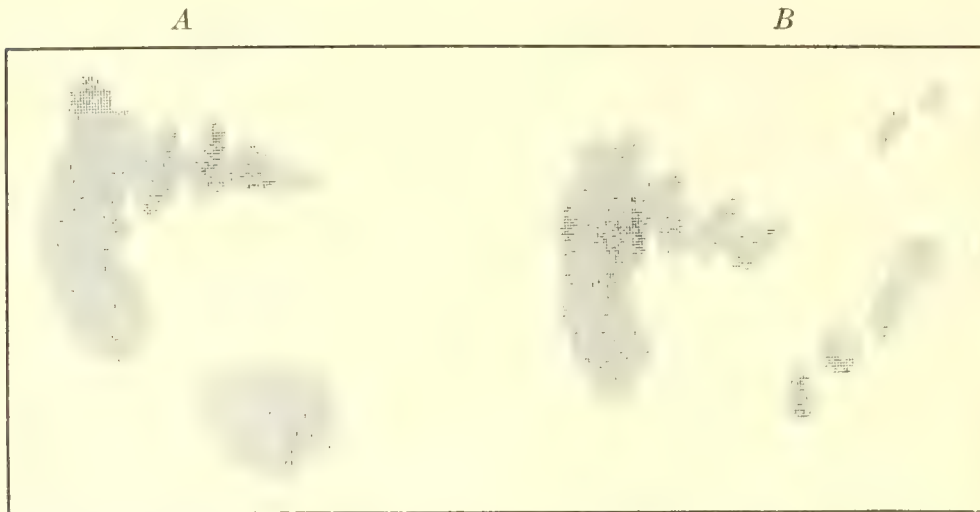


FIG. 73.—Dyskinetic obstipation (hyper-repulsion): *A*, twenty-four hours after meal; *B*, thirty hours p. c. (Schwarz.)

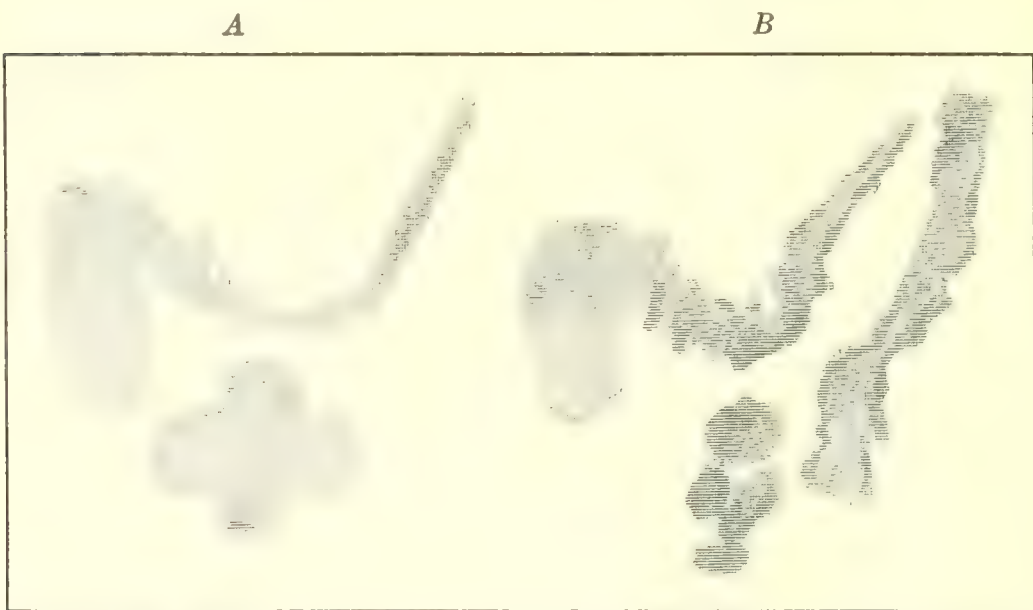


FIG. 74.—Dyskinetic obstipation (hyper-repulsion): *A*, forty-eight hours p. c.; *B*, fifty-four hours p. c.; illustrating retrograde filling of descending colon. (Schwarz.)

Schwarz concluded, as a result of his observations upon people suffering from chronic constipation, that there is no proof of atony of the colon (no widening) or of spasm of the colon.

Briefly summarized, hypokinetic obstipation shows an absence of the physiological segmentation of the fecal column, a delayed arrival of this in the lower intestine, a partial formation of the globus pelvici,

and only a fragmentary emptying. A frequent finding in such cases is undue lengthening of the colon.

Dyskinetic obstipation shows a normal formation of the globus pelvicus at the proper time, but a pathological exaggeration of either the segmenting function of the intestine or of its antiperistaltic function.

Jonas,¹ like Hertz, recognizes that stools may pass through the upper intestine at the normal time, and yet there may be the picture of severe constipation because of delay in passage through the lower segment of the large intestine. His remarks regarding the close association between motor activity of the stomach and colon were referred to last year, and his more recent article merely elaborates what he has previously shown. Jonas lays stress upon the fact that constipation may not only be due to a primary condition of the large intestine, but that the failure of the large intestine to functionate properly may be secondary to some abnormal condition present elsewhere. This is graphically proved by the experimental studies of Surmont and Dubus,² showing the extreme sensitiveness of the colon to stimuli from distant organs. They found that irritation at remote parts of the body caused inhibition of peristalsis. This was illustrated by a case in which the spastic constipation subsided after cauterization of the turbinate bones for nasal irritation. The stimuli acting on the colon may come from the upper part of the digestive tract, from the gall-bladder, genital organs, peripheral nerves or mucous membrane, or may even be of purely emotional origin. In many cases in which the colon seems to be the chief source of trouble, careful search may reveal a primary factor responsible for the more prominent secondary condition of constipation.

The studies of Singer and Holzknecht³ clearly demonstrate that spastic constipation may be a pure neurosis. Usually such patients have a retracted abdomen with occasional protruding loops of intestine, especially at the sigmoid flexure, and strongly contracted sphincters, which resist introduction of the palpating finger. Röntgenoscopy shows alternating contraction and dilatation in the colon, atony at certain parts, and excessive motility of the upper third of the large intestine. Material may be passed along so rapidly that it reaches the rectum in six hours, by which time, in a normal individual, the hepatic flexure has been reached. Such conditions are amenable to medical treatment.

The Medical Treatment of Constipation employed by von Noorden⁴ is described in a recent paper in which he limits himself to a discussion of polyneuritis of enteric origin. He states that actual health is regained

¹ Archiv f. Verdauungskr., December, 1912, No. 6.

² Archives des Malad. de l'app. Dig., April, 1912.

³ Deutsch. med. Woch., June 6, 1912.

⁴ Journal of the American Medical Association, January 11, 1913, p. 101.

only when the intestine is again regulated; that a one-sided diet should only be used for a short time, and that later the intestine should become accustomed to a mixed diet. He insists that one cannot speak of a definite cure until the intestine works regularly on the ordinary diet of which the average man partakes, and until the entire lower section of the intestine is completely emptied at stool. In accomplishing this purpose, he uses practically no laxatives or other drugs, and believes that the best results are obtained in a purely dietetic way, while purgatives, including enemas, only hide the pathological condition of the intestine, and retard the definite cure instead of aiding it. They are justified and advantageous in acute diseases only. Two or three weeks are usually sufficient to establish the correct method of dietetic treatment. While the bowel rapidly recovers, the secondary symptoms, especially the nervous ones, take weeks or months before they fully disappear, a characteristic of all chronic intoxications.

THE SURGERY OF INTESTINAL STASIS. There is still a good deal of haziness in surgical writings upon intestinal stasis. According to some authors, stasis and ptosis are synonymous, while others correctly maintain that these conditions may occur independently, although, of course, both are frequently present in the same individual.

Certain authors, in speaking of ptosis, mention Jackson's¹ membranes. Yet Jackson himself has recently stated that "it is evident to the surgeon who has studied these conditions that there is not the slightest tendency to prolapse of any part of the intestinal canal, with the exception of the cecum, and, in some instances, of the transverse colon. As a matter of fact, the hepatic flexure is held up more closely than usually beneath the costal margin." According to his conception of membranous pericolicitis, this has no connection with, and plays no part in, general visceroptosis. The recent articles of Rovsing² and Lane³ merely repeat opinions regarding intestinal stasis due to ptosis, which have been reviewed in *PROGRESSIVE MEDICINE* for June, 1911 and 1912, and, therefore, require no further mention.

The chief value of Lane's writings is that they call attention to the subject of constipation, especially its causes and its treatment. In the light of our present knowledge, Lane certainly seems to go very far when he claims to cure tuberculosis of the hip-joint, trigeminal neuralgia,⁴ and chronic interstitial nephritis⁵ by side-tracking most of the large intestine.

Last year I stated that the establishment of an ileosigmoidostomy merely lengthens the cecum from a few inches to several feet. Since

¹ *Journal of the American Medical Association*, August 3, 1912, p. 342.

² *Ibid.*, p. 334.

³ *Lancet*, December 21, 1912.

⁴ Mullaly, *Lancet*, September 21, 1912.

⁵ Lane, *Lancet*, December 21, 1912.

then I have seen no reason to change my opinion. The observations of Roith, Hochenegg, and Albrecht, touched upon in this article and added to those reviewed last year, confirm the view that ileosigmoidostomy instead of eliminating stasis, insures its presence in the excluded part of the intestine.

In Albrecht's¹ case, ileosigmoidostomy was followed by the formation of a fecal mass filling the entire cecum, ascending, transverse, and descending colon, a condition which required removal of the partially excluded gut.

An excellent example of the fallacy of total exclusion, has been recently published by Hochenegg.² Fifteen years before, Mosetig had totally excluded part of the intestinal tract for an ileocecal fistula, the part excluded consisting of a large piece of ileum, the cecum ascending, and half of the transverse colon. The ileocecal fistula closed after a while, establishing complete exclusion. Attacks of severe colic, together with the presence of intra-abdominal tumors the size of fists (correctly diagnosed by Hochenegg to be of stercoral origin), justified a second laparotomy. A mass was removed 76 cm. long and 28 cm. in circumference at certain places; it weighed 1730 grams. The excluded gut was filled with intestinal secretions and epithelial detritus. Hochenegg is not only opposed to total exclusion, but also to partial exclusion, for he has seen cases in which the gradual filling of the excluded gut led to the formation of a large fecal tumor, the condition finally giving rise to ileus-like attacks. Instead of partial exclusion, he advises total exclusion, with fistulas at either end of the excluded tract, because he considers a fistula at one end only is apt to close.

GASTRO-INTESTINAL STASIS FOLLOWING PTOSIS. R. C. Coffey,³ of Portland, Oregon, is the author of a most comprehensive monograph which is well worth reading in the original. The accuracy of the observed facts cannot be doubted, but the theories regarding the etiology of pericolic membranes, Lane's kink, and intestinal stasis have not been generally accepted, and are still open to investigation and criticism. (See reviews of the articles by Keith, Flint, and Roith appearing elsewhere in this section.)

Normal Anatomy. In a clear, brief exposition, Coffey states that since in man the abdominal cavity stands on end, the tendency of the upper organs would be to ride down on the lower organs unless special provisions against this were made. The abdominal organs are maintained in their relative fixed positions by four classes of supports, in addition to the normal mesenteries: (1) Prenatal peritoneal fusions to the parietal peritoneum; (2) the shape of the abdominal cavity,

¹ Münch. med. Woch., 1912, p. 1592.

² Wien. klin. Woch., 1912, No. 25.

³ Surgery, Gynecology, and Obstetrics, October, 1912, p. 365.

which provides a broad shelf above the psoas muscle for support of the heavy organs; (3) the force of the abdominal wall which tends to mould the abdominal organs into a mass and hold them on the shelf; (4) extraperitoneal fat which is placed, cell by cell, in such a manner as to regulate intra-abdominal pressure.

In man, as much as possible of the intestinal tract has been attached directly to the parietal peritoneum by peritoneal fusion. The fixed parts of the intestine are the duodenum, ascending and descending



FIG. 75

FIG. 76

FIG. 75.—Anteroposterior section through pelvis, psoas muscles, and left flank. Plumb line represents perpendicular psoas line. (Coffey.)

FIG. 76.—Diagram showing direction and shelf of the normal ascending colon. Arrows indicate direction of intra-abdominal pressure produced by the weight of superimposed organs. (Coffey.)

colon, with their flexures and mesenteries, and, to a certain extent, the rectum. The fixed solid organs are the kidneys, liver, spleen, and pancreas. The parts of the intestinal tube left movable are the middle part of the stomach, the transverse colon, the small intestine down to a point near the ileocecal valve, and the sigmoid colon. The transverse colon is attached by fusion to the posterior leaf of the omentum, which, in turn, is attached to the anterior leaf by the same process. This prevents the middle of the transverse colon from sagging and pulling on the two flexures. When this fusion has taken place, the colon has a support from the bottom of the stomach in the form of the gastrocolic omentum.

The shape of the abdominal cavity is that of a pear, the upper or large end of which corresponds to the diaphragm; the lower, or small end, to the base of the appendix or the crossing of the psoas muscles.

Coffey proved this by removing the stomach and all intestines except the base of the cecum and appendix, from the body of a man who had died of pneumonia. The liver, gall-bladder, kidneys, ureters, and bladder were left. The body was made perfectly level and the abdominal cavity was filled with plaster of Paris (Figs. 75 and 76). Sections of this cast were made, and it was found that the area of the cross-section of the abdominal cavity at the lower pole of the kidney was more than three times the area of a cross-section at the base of the appendix. A greater part of the area of this section of the transverse kidney line, as compared with a section bisecting the psoas or appendix, is practically all behind a perpendicular line touching the front of the psoas muscle. The heavy organs rest upon a shelf with an incline of 51° from the horizontal (Fig. 76). On this padded shelf of the psoas, the kidneys, ascending colon, and a good portion of the liver rest. These organs are held on to the shelf by the strength of the intra-abdominal pressure, much as if a vessel set on a shelf not quite wide enough to prevent its falling off, should have a strip nailed in front of it. The slope of 51° is proved by Coffey to absorb 30 per cent. of the actual weight of the organs.

In a normal individual, the ascending and descending colon are fused with the parietal peritoneum up to, and external to, the pole of the kidney. Intra-abdominal pressure, the degree of which depends upon the quality of muscular tone of the abdominal walls and the amount of subperitoneal fat, holds the organs in their proper places.

Facts Observed Regarding Visceroptosis. In 20 per cent. of human beings, the ascending and descending colon have not completely fused with the parietal peritoneum, and hence there is a mesentery, except at the flexures. In these defective persons, the colon, instead of resting on a shelf or incline, is suspended by a direct drop from the kidney. Coffey has made it a routine to examine all abdominal cases with reference to this subject when the abdomen has been opened. He says, "I have so far not found a single unilateral movable right kidney where a proper rotation and peritoneal fusion has taken place." All cases of floating kidney, mobile cecum, and general visceroptosis are found in this defective one-fifth of the human race. In this connection, it is interesting to remember that 20 per cent. of women coming to the Mayo Clinic have a movable right kidney, and most of them exhibit no symptoms referable to this organ.

General visceroptosis is probably impossible in normal individuals having perfect fusion of the ascending and descending colon with the parietal peritoneum. This explains the fact that the great majority of individuals will not develop ptosis, no matter how thin they are, or how flabby their abdominal walls become.

According to Coffey, the steps in general ptosis are: (1) Deficient peritoneal fusion; (2) sagging of certain portions of the alimentary tract with consequent kinking at the fixed points, with a resulting intestinal stasis; (3) absorption of fat and letting down of all organs as a result of the stasis; (4) consequent relief of intestinal stasis. As this process goes on, the lower abdomen enlarges and the upper abdomen gradually shrinks. Mechanical obstructions are most apt to occur at the junction of fixed and movable parts of the intestine.

Theories Which Have Attracted Attention. Part of Goldthwait's opinion, quoted by Coffey, bears repetition. "The child is born too soon from an embryological point of view, and begins life with a movable colon, and consequently with less natural support for the stomach. The obvious result of this is, that so long as a child is an infant, and its activities and habits are largely those of a quadruped, very little disturbance occurs, but, when the erect posture is assumed, the disadvantages of such formation become evident."

According to Smith, any actual collapse of the thorax or diminution in the upper abdomen, or other characteristics of the enteroptotic habitus, do not appear before the age of twelve years. The child is merely frail, lacks fat, lacks vigor, and shows poor muscular development.

Most children begin to walk when aged fifteen months, and yet, according to these experienced observers, ten years elapse before symptoms typical of enteroptosis become apparent.

Coffey describes right-sided ptosis, midline ptosis, and generalized ptosis (this includes left-sided ptosis). As regards general ptosis, this is supposed to be nature's attempt to avoid kinking of the alimentary tract. One of its chief signs is a floating left kidney. Coffey says a floating left kidney is never seen without a floating right kidney, and, floating condition of both kidneys indicates a general visceral ptosis.

Right-sided Ptosis. It is stated that the cecum being a very heavy organ, and serving as a reservoir for most of the fluids of the intestinal tract, has a great tendency to prolapse; that this pendulous cecum suspended from the lower pole of the kidney kinks a fixed hepatic flexure in direct proportion to the weight of its contents, does not properly empty itself, and consequently produces symptoms of stasis and absorption of intestinal poisons. These symptoms were fully reviewed by me last year in discussing Mr. Lane's ideas regarding this subject.¹

¹ Stasis in the cecum, supposed to be so detrimental by those who share the views of Lane, is considered by others to be an essential part of normal digestion. (See opinions of Keith and others on function of colon reviewed elsewhere.) The assumption that the overloaded cecum is heavier than the rest of the abdominal contents is apparently disproved by Roith (reviewed above), who remarks that the solid viscera of the abdomen, and the hollow viscera plus their contents with the exception of gas, have all practically the same specific gravity.

As regards variations in right-sided ptosis, Coffey says, "in some cases the intestine (colon) pulls loose from the kidney, and the stasis is thereby relieved. In others, the kidney is pulled out of position and the stasis is relieved to a great extent, while in yet others the kidney and hepatic flexure retain their position, and stasis is continued until early adult life, when bacterial invasion often takes place through the wall of the intestine and a pericolic membrane is formed." (For contradiction of this, see Flint's article reviewed below.)

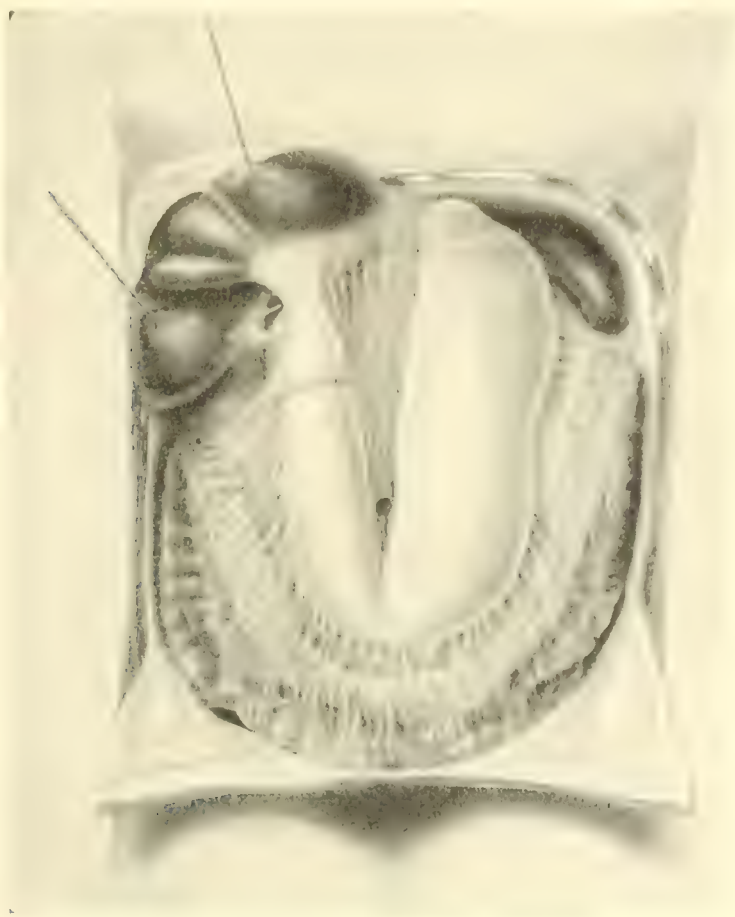


FIG. 77.—Typical "midline ptosis." Middle pyloric portion of the stomach and transverse colon prolapsed while the fixed points at the esophagus, duodenum, and colonic flexures as well as the kidneys remain in normal position. The pylorus is dilated so that the duodenum is continuous with the stomach. (Coffey.)

When the attachment of the kidney to the colon is particularly strong and forms a band, this has been called the nephrocolic ligament by Longyear.

Midline ptosis is an acquired prolapse of those movable portions of the alimentary canal which cross the spinal column and which are suspended by mesenteries from above and from fixed points on the two sides. It has no relation with intestinal rotation, or fusion of the colon with the parietal peritoneum, as is the case in right-sided and general ptosis. In midline ptosis, the pyloric portion of the stomach,

the transverse colon, and, at times, the free margin of the liver may be involved (Fig. 77). Midline ptosis produces stasis only when the normally fixed points, at the second portion of the duodenum or at the splenic or hepatic flexures, or both, remain fixed. Therefore, midline ptosis producing stasis, not only is no part of the general ptosis, but cannot exist with a general ptosis. As a rule, it is independent of any other form of localized ptosis. According to Coffey it is an acquired condition resulting from the combined effects of a chronically loaded colon or an overdistended stomach, plus long-continued or severe exertion, or occupations requiring prolonged standing. Contraction of the upper abdomen, or adhesion of the omentum to the peritoneum below may render such a midline ptosis permanent.



FIG. 78.—Suturing cecum and ascending colon to parietal peritoneum by a series of purse-string sutures, when operation is done through a right rectus incision. (Coffey.)

In discussing normal anatomy, it was mentioned that the omental bursa usually became obliterated. When this obliteration has failed to take place, there is no gastrocolic omentum, and therefore no support for the colon from the greater curvature of the stomach. Under such circumstances, the transverse colon is specially prone to ptosis, with sharp kinking at the splenic flexure, and there is subsequent development of very obstinate constipation. (See Smoler's case below.)

Pericolicitis. Coffey says, "The pericolic membrane develops during the first few years of adult life, and is of bacterial origin. Its development is apparently secondary to stasis accompanying the mobile

cecum. The membrane is usually harmless until the hepatic flexure begins to loosen in the course of a general ptosis, at which time it begins to hold part of the weight of the mobile cecum and thereby produces pain, or, by contracting unevenly, produces secondary stasis." When it acts evenly it does no harm and is a conservative process.

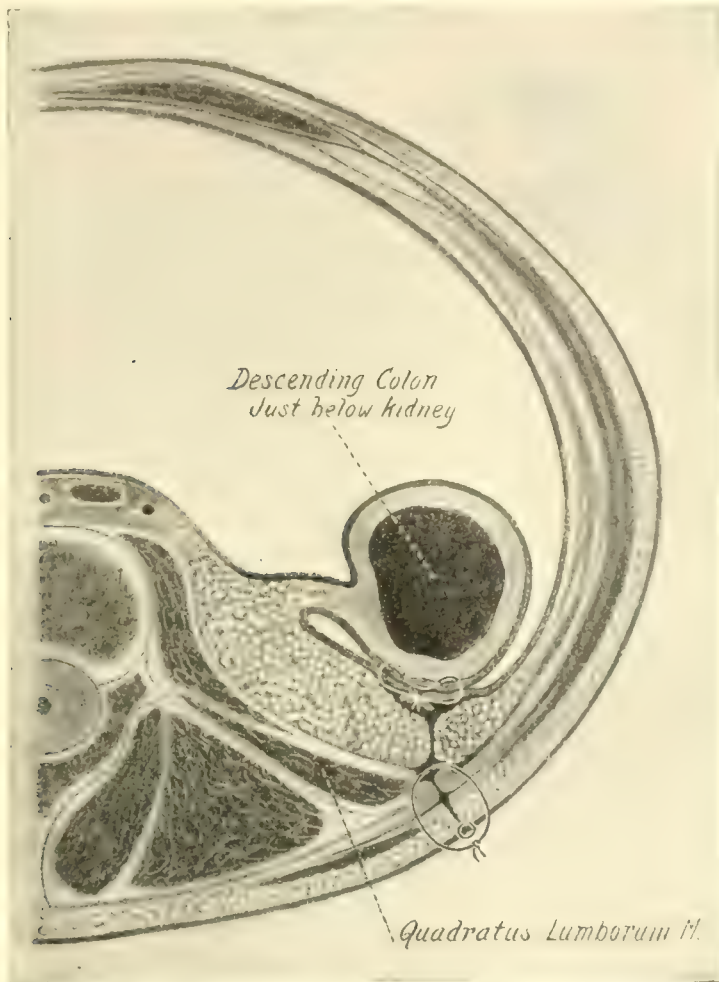


FIG. 79.—The mobile colon is sutured to the posterior parietal peritoneum as the incision through which the appendix was removed is being closed. (Coffey.)

Lane's kink of the ileum has nothing to do with ptosis, according to Coffey, although it is conceded that the symptoms are similar to those from right-sided ptosis. Coffey believes it to be the result of inflammatory processes originating from the appendix. Compare these opinions regarding pericolicitis and Lane's kink, with the findings of Flint reviewed elsewhere in this section.

The Surgical Treatment of Intestinal Stasis from Ptosis. Coffey's remarks regarding indications for interference are sensible and most commendable. He states, "The large majority of cases of ptosis may be successfully treated by medical and dietary measures. Surgery should never be considered for the treatment of ptosis *per se*. . . . I concede that in bringing forward this subject of ptosis and stasis.

we are opening one of the most dangerous fields for surgical abuses that has ever been opened to the surgical 'confidence man,' who needs no other excuse for performing a surgical operation than the consent of the patient. X-ray observation is of inestimable value in the study of these cases, but is, I concede, the most dangerous agent yet placed at the disposal of the unscrupulous surgeon, because it is so convincing to the laity, and, at the same time, so meaningless when considered independently of the history of the case, and not properly interpreted. Gastric or intestinal stasis not relieved by medical and dietary measures constitutes the only excuse for surgery in this class of cases."

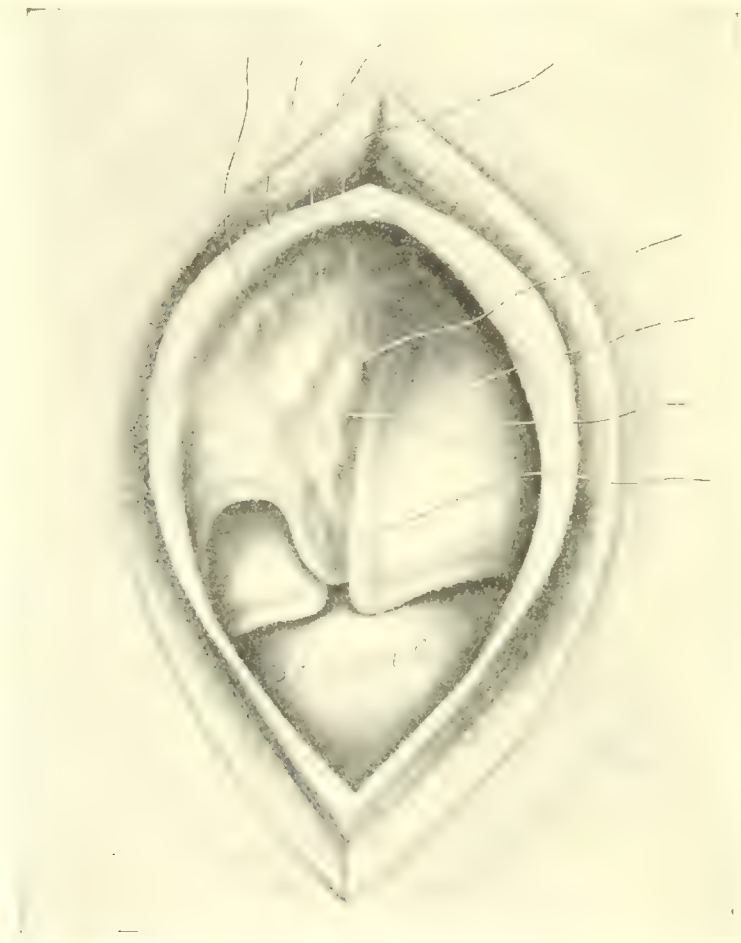


FIG. 80.—Shortening the falciform ligament. (Coffey.)

Given a right-sided ptosis with a moderately movable right kidney, painful cecum, and appendix, not relieved by medical measures, the proper treatment is, removal of the appendix, and fixing the ascending colon through a right rectus incision (Fig. 78) plus fattening. This will be sufficient to retain the kidney in position. If the right kidney is exceedingly movable and the symptoms demand surgical relief, the appendix is removed and the colon and kidney both fixed through a posterior incision (Fig. 79)." A coexisting pericolic membrane may, or may not, be removed, according to the judgment of the operator

at the time. Coffey usually has not removed it. He states that an operation which fixes a floating kidney without fixing the colon at the same time, is not a sound surgical procedure.

A mobile cecum with or without the pericolic membrane in which the hepatic flexure remains fixed, is best treated by fixing the cecum and ascending colon to the parietal peritoneum (Fig. 79).

Midline ptosis of long standing not relieved by proper medical treatment is successfully treated surgically by shortening the ligaments of the liver (Fig. 80) and stomach (Fig. 81), suturing the omentum to the abdominal wall (Fig. 82) and expanding the upper abdomen. The



FIG. 81.—Falciform ligament shortened. Sutures passed through the right and left lobes of the liver for making a Y-shaped ligament. Sutures placed for shortening gastrohepatic omentum by Beyea's method. (Coffey.)

results following this method of treating midline ptosis with stasis "are fully as striking and complete as those produced by a gastro-enterostomy for mechanical obstruction at the pylorus." The illustrations explain all these steps clearly, but it may be worth while to give the detail of Coffey's method of widening the upper abdomen (Figs. 83 and 84): "Split the anterior sheath of the recti muscles an inch or more from the median incision (the median incision being previously made with the greatest care, exactly in the centre line), dissect the aponeurosis from the muscle and reflect toward the median line, pass

silkworm-gut sutures through skin fat and reflected flap, and leave to be tied after layers have been sutured. Bring the reflected edges on the fascial flaps together and suture in the median line, leaving the front surface of the recti muscles bare and the original median cut through the conjoined aponeurosis unsutured." This operation is part of Coffey's regular routine in the surgical treatment of midline ptosis. Forty-one cases are reported in which the hammock operation or omentopexy was the central feature. Twenty-six were symptomatically cured.

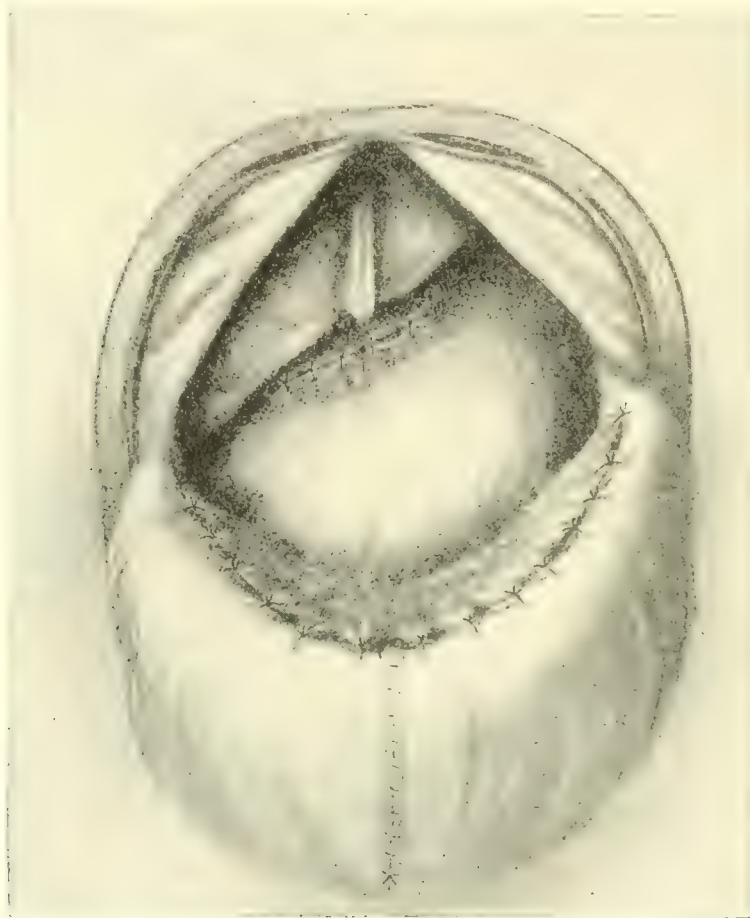


FIG. 82.—Completed Beyea operation and "hammock" operation, shown by reflecting the upper part of the abdominal wall downward after the operation is complete, including the closure of the abdominal incision. (Coffey.)

For further details of the cases in which cure was not accomplished and which furnish many points of interest, the reader is referred to the original article.

The treatment of Lane's kink is illustrated by Figs. 85 and 86, which require no further comment.

Sigmoid ptosis producing severe stasis can only be successfully treated by short-circuiting or excising.

All these methods of relieving stasis, which have just been enumer-

ated, indicate that their author is a surgeon of moderation and good judgment.

A striking example of the successful surgical cure of midline ptosis has been published by Smoler.¹ The patient suffered from obstinate constipation. An *x*-ray examination revealed the stomach in its normal position, while the transverse colon was prolapsed almost into the pelvis (Fig. 87). The colon was the only prolapsed organ. When this was sutured in its proper place (Fig. 88), the constipation was cured.

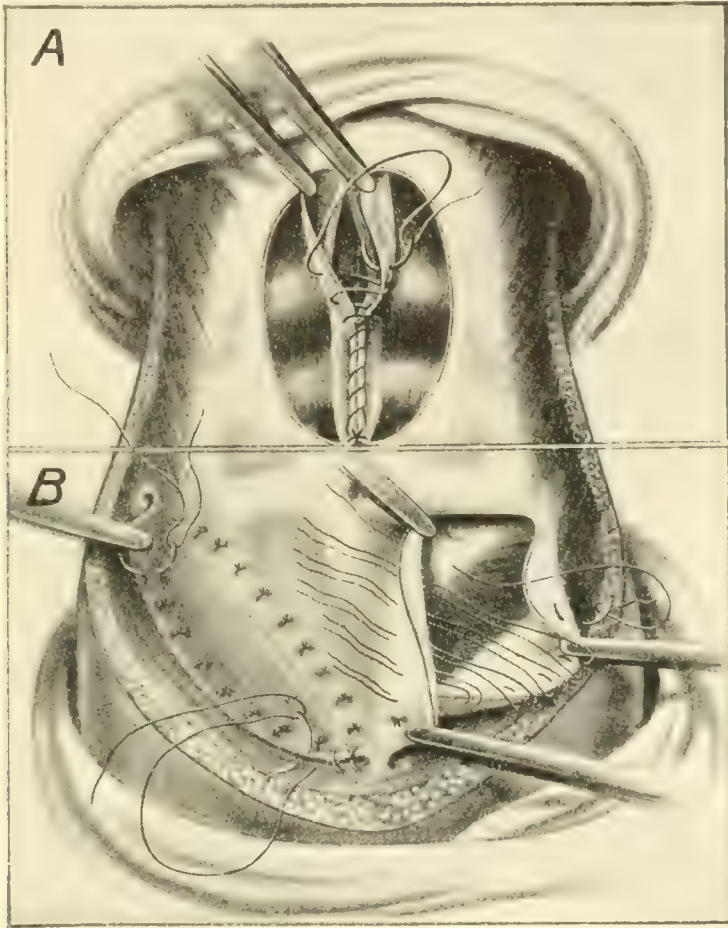


FIG. 83 A.—The anterior aponeurosis of the external oblique has been cut and reflected inward. The reflected edges are being sewed. (Coffey.)

FIG. 83 B.—The tendon of the external oblique has been split and the flaps are being imbricated, thus narrowing the lower abdomen and making autoplasmic bandage. (Coffey.)

Schlesinger² suggests resecting the pars media of the stomach in atony of that organ, as shown in the accompanying diagram (Fig. 89). The supposed advantages of this operation are: There are no abnormal adhesions from such a procedure; the colon is raised, hence constipa-

¹ Zentralbl. f. Chir., 1912, p. 497.

² Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxv, Heft 3, S. 537.

tion is improved; and the stomach is given its proper shape. This method is too radical to gain general acceptance.

The Embryonic Origin of Jackson's Membranes and Lane's Kink. In a small series of dissections of embryos and infants at term, Flint¹ found Lane's kink of the ileum and Jackson's membrane with all their variations. From this he concluded that unless the unproved theory of fetal peritonitis was accepted, these findings indicated the evolution

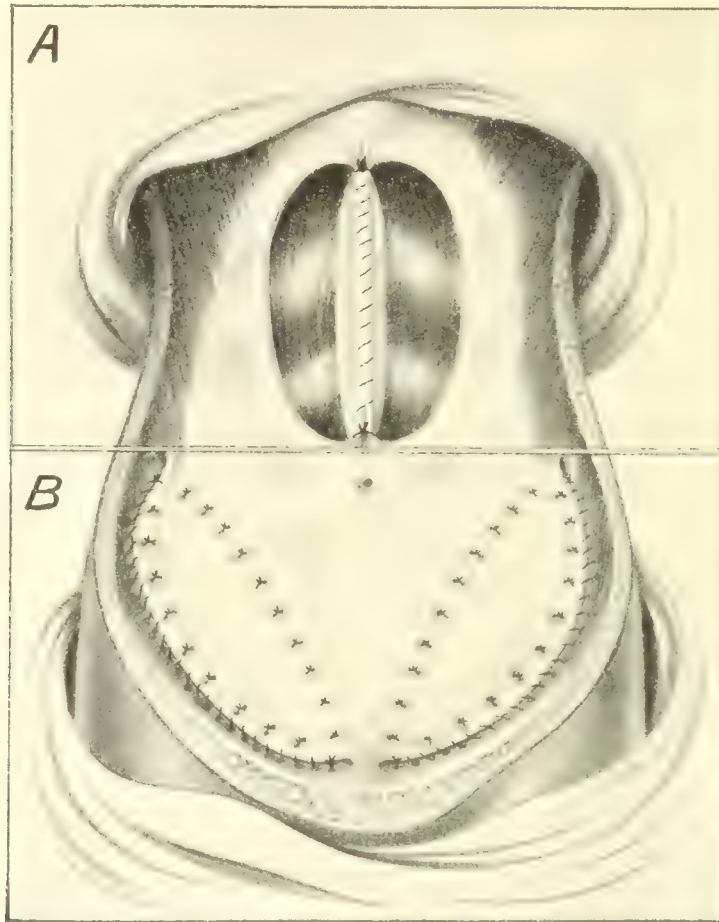


FIG. 84 A. Upper abdomen expanded. (Coffey.)

FIG. 84 B.—Contraction of lower abdomen completed, forming autoplasmic bandage. (Coffey.)

of adult pericolic membranes of the commoner type, and that these findings, in his relatively small series of embryos, merely served to emphasize the frequency with which such veils may occur. And, therefore, he believes that: "These veils are embryonic and normal structures, and are not due to the organization of an inflammatory deposit or to a series of mild infections originating from a chronic colitis."

He goes on to say that "surgeons will recognize, in these cases in which the appendix is involved in the process of fusion, types of appen-

¹ Johns Hopkins Hospital Bulletin, October, 1912.

ditis which, in adult life, have hitherto been looked upon as resulting from chronic adhesive appendicitis, but which are, in reality, organs that are covered by an embryonic membrane and not infrequently drawn up and kinked during the descent of the cecum" (Fig. 90).

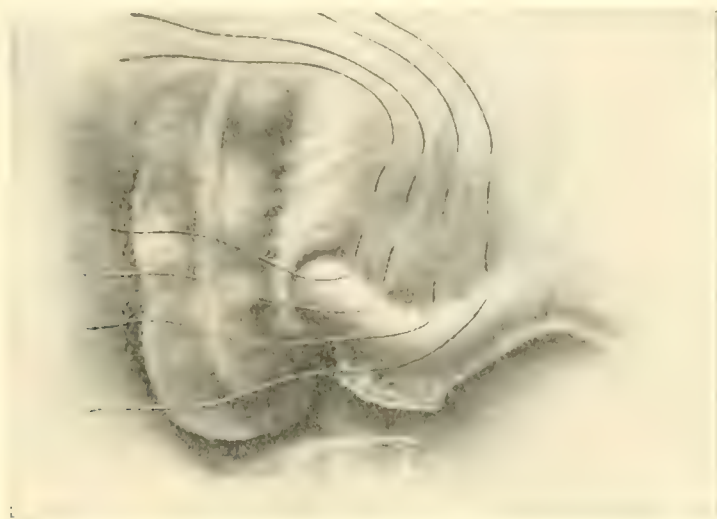


FIG. 85.—Placing purse-string sutures for shortening upper leaf of mesentery of the ileum. (Coffey.)

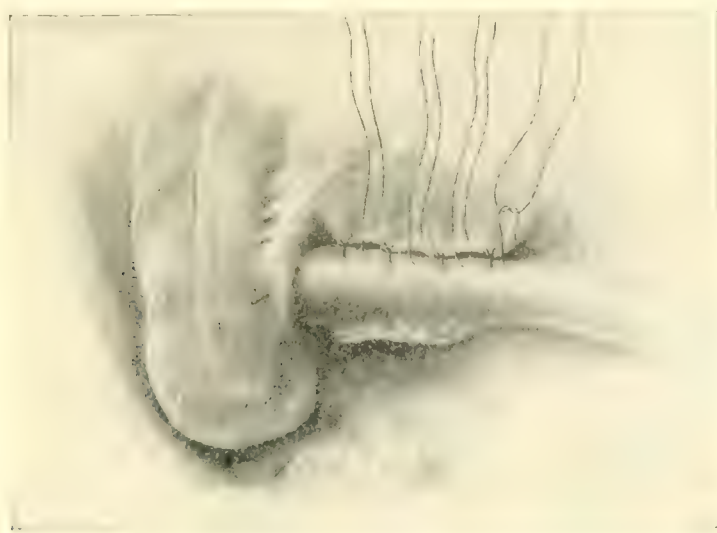


FIG. 86.—When the sutures are tied the mesentery is shortened, ileum elevated, and the kink relieved. (Coffey.)

A particularly interesting observation was made at autopsy in an infant, aged eleven months, in which neither the illness nor the cause of death was in any way associated with the intestine, and nevertheless, in which a marked band was found, apparently forcing the conclusion already reached by Charles Mayo that some of these cases are certainly congenital.

While, in the great majority of cases, these membranes do not cause their possessors any trouble, it is conceded, nevertheless, that in certain occasional instances, they may give rise to symptoms of a very definite

nature which are not infrequently either confounded with, or actually associated with, chronic appendicitis, especially when the veils are extensive and badly placed from a mechanical point of view, and ptosis is present.

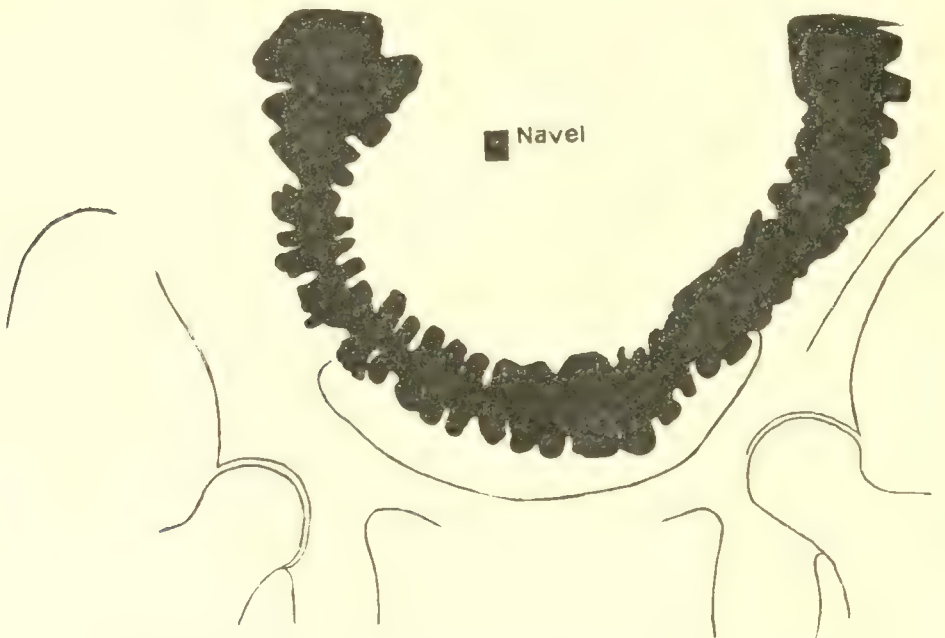


FIG. 87.—Midline ptosis of transverse colon only. (Smoler.)



FIG. 88.—The same after operation. (Smoler.)

Three cases are cited, with tenderness over the cecum or in the pelvis on the right side, as well as a marked reaction high up in the flank. In them, the chronically inflamed appendix was found hanging over the brim of the pelvis, and there was a well-marked veil on the ascending colon. There was no ptosis, no involvement of the kidney and ureter, and no chronic colitis. None of the patients were neurasthenic. Incision of the veils relieved all three of the cases.

The instances reported by Jackson and Connell are referred to, in which simple appendectomy gave no relief, but where reoperation and removal of the veils accomplished the desired result. To these, Flint adds a similar case of his own.

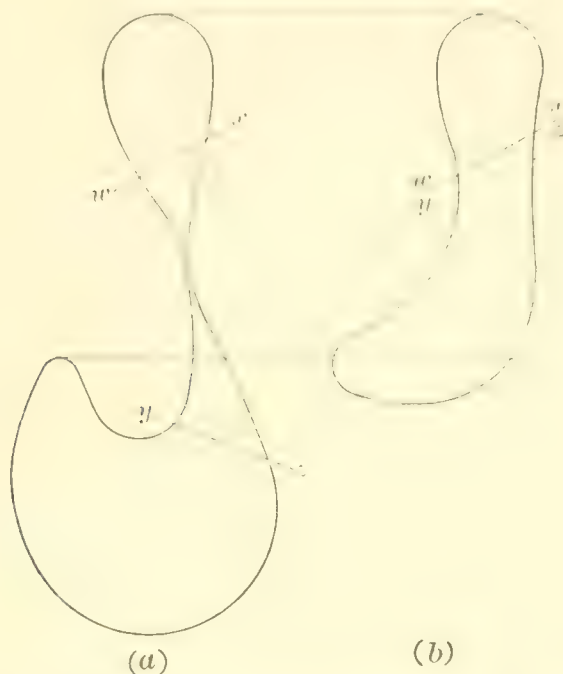


FIG. 89.—Schlessinger's resection for gastropotosis: *a*, before resection; *b*, afterward.

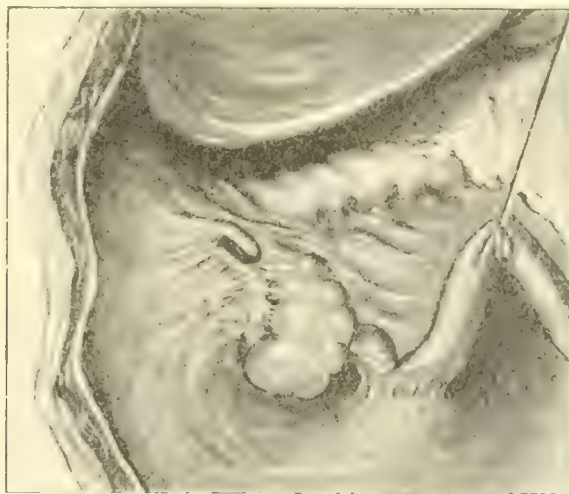


FIG. 90.—Human embryo 22 cm. long. Cecum partly descended. Embryonic membrane extending over the appendix and ascending colon. Elevation of the terminal ileum reveals the fusion between the posterior leaf of the mesentery and the ileum itself in the form of an embryonic Lane's band. With an attachment like this, the ileum may roll on itself during descent. (Flint.)

It is acknowledged that the oft-observed angulations of the structures of the colon, the Lane's kink of the ileum, and the kinking of the appendix by veils are all predisposing to inflammatory conditions.

Inflammatory involvement of these embryonic structures is also

conceded by the statement, "It is not impossible that these bands may become somewhat thickened as a result of chronic colitis. This is indicated in the denser strands of connective tissue in some veils."

The treatment of the pericolic membranes consists in their simple division along the lateral border of the colon. The Lane's kink is divided along the mesenteric border. Charles Mayo smears the denuded surfaces with vaseline.

To close this consideration of the surgery of constipation, it is well to remember that immediate improvement is not a reliable sign of cure. Ochsner's remarks about cecopexy apply equally well to other operations for intestinal stasis.

He says: "We have all seen patients who, after the most trivial operation, have felt much better, when the real thing that was the matter with them was not touched. I have seen many such cases that were very much better from gallstone trouble by simply having the appendix removed. For five or six weeks, or two or three months, they were directly under the doctor's care and had to live in a fairly reasonable manner, and some of them may form the habit of living in a reasonable manner permanently, and, notwithstanding the disturbance of the gall-bladder and the presence of stones, they were very much better for a while, but sooner or later the gallstone trouble recurred. Their improvement was incidental, and I should imagine that the improvement which we hear reported in these cases of fastening up movable ceca will probably have to be classified as incidental improvements."

THE RECTUM

Prolapse of the Rectum. In a most logical and convincing paper, Moschcowitz¹ deals with the etiology, anatomy, and cure of rectal prolapse. He states that his theory and operation are based upon the demonstrable fact that prolapse of the rectum is a hernia, and that in all its features—etiological, pathological, clinical, and therapeutic—it conforms to the well-recognized principles governing hernia in other parts of the body.

Certain anatomical facts are stated as premises. These are:

1. That the entire abdominal parietes, front, sides, top, and bottom, are lined with peritoneum.
2. External to the peritoneum there is a layer of fascia everywhere. This fascia has received different names in different parts of the abdomen—transversalis, pelvic, iliac, diaphragmatic, etc. If traced, however, it will be found that these are merely part of one continuous layer.

¹ Surgery, Gynecology, and Obstetrics, July, 1912, p. 7.

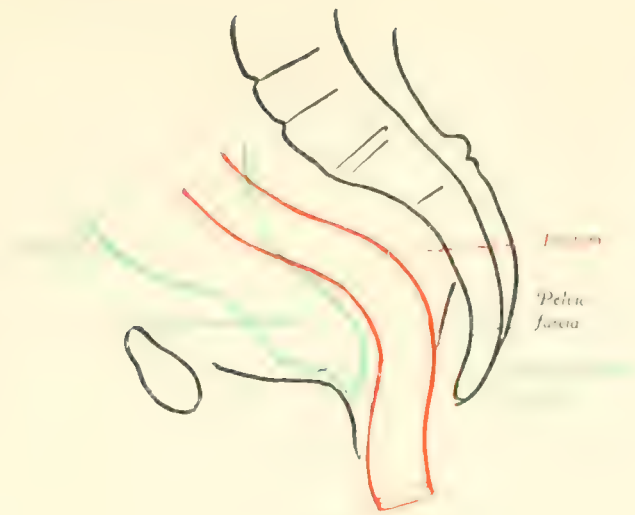


FIG. 91



FIG. 92



FIG. 93



FIG. 94



FIG. 95

3. All the large vessels in the abdomen and all the viscera of the abdomen *lie* upon the transversalis fascia, and are *covered by* the peritoneum. This fascia is, as a rule, strong enough to retain the viscera within the abdomen. However, it is not strong enough to do so at certain definite anatomical points, and it is at these points, and these only, that we find herniæ. A little reflection will show that herniæ occur only where bloodvessels or viscera make their exit normally, and at these points the perivascular or perivisceral projections of the transversalis fascia are attenuated.

The eversion of the transversalis fascia on the anterior wall of the rectum constitutes such a weak point. As is well known, there are two theories for the origin of hernia: one, which considers the sac as a congenital malformation, and a second, which regards a defect in the transversalis fascia as the essential cause. Moschcowitz believes that both of these theories are applicable to prolapse of the rectum. Regarding the congenital theory, he says: "In early embryological life, the peritoneum reaches downward almost to the perineum. Later it becomes shut off, and recedes higher and higher. It is quite conceivable that if the shutting-off process stops early, the cul-de-sac of Douglas will be different than normal. This affords a substantial basis for the congenital or saccular theory of rectal prolapse." He is, however, more inclined to the second theory, except in those cases in which the congenital nature of the condition is perfectly evident.

Given such a point of weakness, it is only necessary for some increased intra-abdominal pressure to drive the peritoneum into the sheath formed by the outward prolongation of the transversalis or pelvic fascia. The subsequent development of the prolapse is governed by the following anatomical facts:

The peritoneum covering the anterior surface of the rectum is intimately adherent to it. This explains why, in spite of the fact that prolapse of the rectum is a hernia, there is no distinct and separable peritoneal sac. A condition analogous to the so-called "*hernie par glissement*."

The under surface of the levator ani is also covered by a very dense fascia; this, together with the other component parts of the perineal body, prevents the progress of the hernia in a downward direction.

The prolapse increases at first in a posterior direction (Figs. 91 and 92), until it impinges upon the immovable posterior wall of the rectum lying upon the sacrum and coccyx. This prevents further backward progress, and causes a change in direction downward to the anus (Fig. 93), which is finally forced and the prolapse appears externally (Fig. 94).

(Moschcowitz observed 2 cases in which the coccyx was removed and a hernia through the rectum was present. There was no external prolapse. He believes these to be illustrated by Fig. 95, where, in the

absence of the coccyx, the posterior wall of the rectum also gave way and appeared as a bulging in the scar.)

Still later, after appearing externally, the lowermost part of the rectum being firmly fixed, the prolapse cannot increase at its expense. Therefore, in the subsequent growth it can enlarge only by drawing in, first, the two lateral, and, finally, also the posterior walls, until the further drawing of the bowel is prevented by the firm fixation of the organ.

This has a very important bearing upon the physical signs of complete prolapse, and explains why even the largest prolapses never exceed five or six inches in length.

In its early stages, naturally, the rectal protrusion is invisible, and consequently the patient ascribes his symptoms as due to hemorrhoids, habitual constipation, etc. When the prolapse is visible, certain symptoms are to be noted before reducing. Thus, the condition of the mucous membrane, which may be more or less ulcerated, the posterior direction of the central opening, the tympanitic note over the anterior half, which usually contains small intestine, are all to be noted, and, further, it is stated that "if the case has been neglected and has not been operated upon before, invagination of the finger between the sphincter and the anterior surface of the prolapse will be prevented by a sulcus of about an inch in depth (Fig. 94). In prolapse of the anus there is no such sulcus, because the prolapse begins at the mucocutaneous junction; while in intussusceptions the sulcus is so deep that it never can be reached by the examining finger. Unless incarcerated, the entire prolapse can be reduced either by the patient's contracting the levator ani or by replacing it manually."

In this connection, an observation of my own may be worth mentioning. About four years ago I saw a man, aged forty-five years, who could extrude a rectal prolapse fully four inches. By fixing the muscles of the abdominal wall and making a deep inspiration he was able to cause the prolapse to disappear almost completely.

When the prolapse is reduced, Moschcowitz calls attention to the following physical signs: The rectum imparts a sensation of fulness to the examining finger because the normal outlines are obliterated, and because of the laxity of the tissues. The anterior surface gives as distinct an impulse on coughing as any hernia. To prove that the rectal prolapse is a hernia, Moschcowitz relates the following interesting phenomenon--namely, that after reduction of the prolapse, if the finger be introduced along the anterior rectal wall, it requires but the slightest pressure of the finger to keep the prolapse reduced, no matter how much the patient strains, while, if the finger is held against the posterior rectal wall, no amount of pressure exerted can prevent the prolapse from coming down.

In discussing the treatment of this condition, Moschcowitz gives

a complete, well systematized review of the various methods employed up to date—a valuable source of reference for anyone interested in the subject.

Moschcowitz describes his method of operation as follows: “Median abdominal incision, extending from the symphysis pubis to the umbilicus. After opening the abdomen, the patient is placed in an extreme Trendelenburg position. Everyone with any experience knows the depth of the cul-de-sac of Douglas in a normal case, but he will be intensely surprised at its depth in cases of prolapse of the rectum; in fact, it extends several inches beyond the anus, as one can readily convince himself. The rectum is now pulled up and held taut. The subsequent steps vary according to the sex of the patient; an operation in the female sex is described.

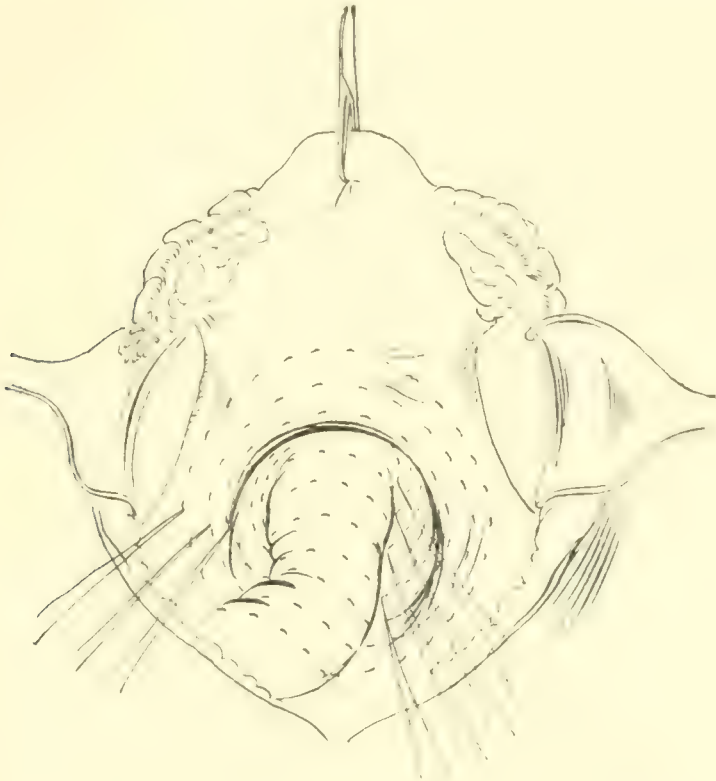


FIG. 96.—Moschcowitz's operation for prolapse of the rectum.

“Pagenstecher or silk sutures are passed circularly around the cul-de-sac of Douglas, and tied. The lowermost suture is placed about one inch above the inferior extremity of the cul-de-sac, and then tied; similar sutures, six to eight in number, are passed at intervals, and persisted in *as long as the surrounding peritoneum will permit* until practically the entire pouch of Douglas is obliterated” (Fig. 96).

Moschowitz says, “It is advisable and I always try to include in my suture the pelvic fascia, particularly that part which covers the levator ani; how often I really succeed in doing this, I am not in a position to state.

"Theoretically, it would be better to split the peritoneum in the depth of the cul-de-sac, and to suture the facia first. I have attempted to do so in one case, but found the procedure so difficult that I abandoned it." (See review of Jianu's proposal below.)

When the sutures reach the region of the supravaginal portion of the cervix and body of the uterus, the sutures are anchored in these structures.

When approaching the rectum, the sutures coming from the sides of the pelvis, catch the serosa covering it, in firm, close stitches. This is done in order to prevent the possible formation of a hernia; in addition, these lateral sutures also materially aid in fixing the rectum to the sacrum and coccyx.

There are two structures which should be avoided, namely, the ureters and internal iliac vessels. The former can be marked by introducing ureteral catheters; the pulsation of the latter serves as a guide.

In all the women, the uterus is stitched to the anterior abdominal wall.

Fixation of the sigmoid flexure should not be done, as it is unnecessary and entirely superfluous.

Moschcowitz has been performing his operations since June 30, 1907. He has had 9 cases, and the results have been excellent. I have personally examined the patients.

It is mentioned that Quenu and Duval, in 1910, suggested placing two sutures circularly in the sac of Douglas; and further, that Bardenheuer and Samter, in 1902, also advocated a similar procedure. All these authors, however, considered colopexy as the principal part of their operation. Moschcowitz's article constitutes a most satisfactory and systematic exposition, which brings the entire subject up to date.

Jianu¹ has suggested an operation for prolapse of the rectum which belongs to the type more suitable in a course of operative surgery upon the cadaver, rather than in the operating room upon the living. After opening the abdomen and emptying the pouch of Douglas, it is proposed to incise the peritoneum transversely between the rectum and either uterus or bladder, according to sex. Upon retracting the sides of this wound, the muscular fibers of the levator ani should come to view upon the right and left. These edges should be united by a series of interrupted sutures which also include part of the anterior rectal wall. The last suture should also pass through part of the prostate or fibrous coat of the vagina. In this way the pouch of Douglas is to be closed. When this has been finished, a suture of the sigmoid to the bladder and left side of the pelvis, above the brim, is recommended. As mentioned above, Moschcowitz independently attempted, in one case, to expose the levator ani by this method, and found it to

¹ Deutsch. Zeitsch. f. Chir., Band cxviii, p. 592.

be impracticable. The method of Jianu is far more complicated than that of Moschcowitz, and, judging by the latter's cures, of from one to six years, his method is quite satisfactory.

Rectal Cancer. In the three articles reviewed below, the viewpoint of Cripps is too conservative, that of Miles errs on the side of safety, and in certain instances is perhaps too radical, while the opinions of William Mayo represent a well-balanced combination of radical and conservative methods. The noted English authority, Harrison Cripps,¹ opened the discussion on carcinoma of the rectum at this year's meeting of the British Medical Association. Cripps did not agree with Handley, who stated that carcinoma spread along the submucous lymphatics for several inches or feet from its original site without producing any tumor or hardness by which it could be detected. This accounted for the local recurrences so frequently observed, hence, at operation, Handley advised that lengths of bowel amounting to inches or feet should be cut away.

In discussing this opinion of Handley's, Cripps said that, according to his experience, the lymphatic and glandular involvement occurred late, and recurrence seldom took place except at the extreme edge of the cut margin; and even this was exceptional, for, in most cases, recurrence was not in the remaining part of the bowel, but in the connective tissue and structures lying immediately external to the part removed. Cripps then went on to say that he had seen repeated recurrence in the neighborhood of the ischiorectal fossa and the skin near the anus, while the bowel itself, at the cut margin and along the whole of its course upward, remained entirely free from any visible involvement up to the time of the patient's death. An inch or so could be regarded as a fair margin, and whenever he had been able to secure this, he could scarcely recall a case of recurrence in the cut margin itself. Regarding the widespread dissemination described by Handley, Cripps stated that, in his own practice, there were dozens of cases which had remained perfectly well from three to twenty-five years after removal, where less than an inch of margin had been allowed. Lastly, among the most successful cases were those in which two or three inches of diseased bowel, with perhaps only half an inch margin allowed, had been cleanly cut out with subsequent end-to-end anastomosis.

In discussing the diagnosis, Cripps strongly urged using the utmost gentleness in digital palpation. He had twice seen death from acute septic peritonitis following the simple digital examination of rectal cancer. Two similar cases occurred following the use of bougies. The sigmoidoscope he regarded as worse than useless—at times even misleading. A diagnosis of carcinoma can never be made by "sight

¹ British Medical Journal, October 3, 1912, p 843.

alone, touch only, by indicating hardness and friability, has to be relied on."

As regards operation, Cripps found but one-third of the cases coming under his observation suitable for excision.

Chief among the criteria for radical interference were: Lack of demonstrable metastasis and mobility of the involved part of the rectum. In advising the usual colostomy for hopeless cases, Cripps says: "The suffering and misery of cancer are not so much caused by the disease itself, which is comparatively painless, as by the stricture which so frequently accompanies it. The constant desire to go to stool, the feeling of inefficient relief, and the dread of impending complete stoppage, are all due to the stricture rather than to the disease itself. . . . The condition of the patient is generally markedly improved by colotomy, and the remainder of life rendered comparatively painless and tranquil."

Regarding the technique of excision by the sacral and perineal route, Cripps advises this for the cases in which the upper border of the disease is not more than 4 inches from the anus. "The lithotomy position is best. Posterior division and resection of the rectum up to, or along the side of, the coccyx, or removal of this bone, if necessary, will be found to give all the room required, and it is better to remove each side of the rectum separately. If the patch of disease is limited, only involving a portion of the circumference, it is of advantage to remove the growth with a moderate margin free from disease, and not the whole circumference of the bowel. Ever so narrow a strip of healthy mucous membrane greatly facilitates the after-treatment in the prevention of stricture, and some of the cases treated in this way remain permanently free from recurrence, and have had no trouble from stricture. In those cases in which the growth is more than 4 inches from the anus, it is advisable to saw across the lower part of the sacrum, 2 or 3 inches being removed. Here the position should be prone, with the thighs hanging over the edges of the table, the knees resting on a chair. Under these circumstances, if the lower part of the rectum is free from disease, it should be left, the involved portion with an adequate margin being excised. In exceptional cases, immediate end-to-end union of the bowel may be feasible. Usually, owing to tension, this is not possible." Cripps has never succeeded in obtaining primary union in the lower rectum for this reason. On the other hand, he has had some very satisfactory cases of secondary joining. He prefers to wait a year or so before doing this, for by the end of that time, recurrence is unlikely, and the upper segment has become considerably prolapsed, protruding two or three inches. The end of the bowel being comparatively mobile, the two ends can then be carefully dissected out and united with little or no tension, and the superficial parts closed over them. An example of this was the case of a patient

in whom 4 inches of the bowel were excised, the last 3 or 4 inches of the bowel, including the anus, being left intact. The ends of the cut bowel could not be drawn together, so the upper segment was fixed in the upper angle of the wound. Two years later, there was a prolapse 3 inches long from the upper wound; no recurrence. The secondary anastomosis was easily carried out. The patient regained complete control and remained quite well for thirteen years.

Contrary to general opinion, a preliminary colotomy before excision is not held of much value by Cripps. He says: "If it is on the ground of preventing the wound being soiled by fecal matter, this is a false hypothesis, for feces appear quite innocuous in any wound if the part is kept clean. The operation, too, is premature if it is intended to correct a stricture which may never occur." His remarks regarding abdominal section contain nothing new.

His experiences with recurrence have already been quoted. Regarding its treatment, he states, "that when it occurs in the glands or tissues external to the bowel, probably nothing further can be done, but if the recurrence is in the cut margin, a second, or even third, removal may end in ultimate success." He cites such a case in which the local recurrence was twice removed. The final removal was twenty-five years ago, and the patient is still alive and well.

He ends his most valuable article by stating "that nearly 40 per cent. of the cases were curable when removal was practicable, "and that "if recurrence takes place, it almost invariably shows itself within twelve months, and is very rare after two years."

The statistical tables appended to the article of Cripps deal with observations upon 445 patients observed over a period of thirty years. Briefly stated, they showed that cancer of the rectum is twice as frequent in men as in women; that two-thirds of the cases were discovered too late for radical excision; and that colotomy prolongs life.

In Great Britain, Miles¹ has taken a very radical stand regarding carcinoma of the rectum. He found that his results were very poor after operating from below. Recurrence occurred in the skin near the anus, and in the ischiorectal fat. Upon removal of these tissues, there was further recurrence in the levator ani, prostate, bladder wall, and presacral tissue. His attitude, therefore, became more radical. Even then there was recurrence in the peritoneum of the pelvic colon and mesocolon. Of 58 operations by the perineal route, only 3 were cured. Miles considers the usual resection of carcinoma of the rectum as useless, whether it be done by the perineal or abdominal route, because it is not sufficiently radical. He therefore advocates the following operation: After preliminary colostomy, the entire pelvic colon and its mesentery is removed. This implies extirpation of levator ani,

¹ Glasgow Medical Journal, February 1912, and British Medical Journal, January 25, 1913.

all of rectum or anus, and ischiorectal tissue. Of 42 cases operated upon by this method, 17 (40 per cent.) died of sequelæ of the operation (peritonitis, shock, etc.). Of 25 survivors, only 4 had recurrence; 2 died from other causes than carcinoma; 19 survivors are free between two and four years after operation.

In carcinoma of the rectosigmoid, Vignolo¹ first establishes an artificial anus. After resection, an end-to-end anastomosis is made between a segment of small intestine and the rectal stump. Three weeks later, when firm union has taken place, the artificial anus is closed.

In suitable cases with a sufficiently mobile transverse colon, it may be possible to follow the suggestion of Veber,² who proposed suturing the transverse colon to the denuded sphincter ani, according to the method used by Ali Krogius with the sigmoid. (Reviewed in *PROGRESSIVE MEDICINE*, June, 1912, p. 129.)

THE RADICAL OPERATION FOR CANCER OF THE RECTUM is discussed by W. J. Mayo,³ in a paper which brings the entire subject of the surgical cure of carcinoma of the rectum up to date. Mayo states that the last two years have witnessed wider extirpation and more extensive removal than heretofore, and that an important group of cases formerly considered hopeless, is now held to be operable. The two most important factors in obtaining these improved results are: (1) Elimination of cases of abdominal metastasis by preliminary abdominal exploration, thus avoiding extensive and dangerous operations which would be of no benefit to the individual; (2) the acceptance of a permanent colostomy, either sacral or abdominal, as a necessary evil in the majority of cases.

While it is conceded that a brilliant result is occasionally obtained by drawing the sigmoid downward and passing it through the muscles of the anal canal from which the mucous membrane has been removed, nevertheless, such fortunate instances are rare. In most cases a preternatural anus at the normal situation is the result of such an attempt, and merely amounts to a colostomy in an unfortunate situation—the anal site.

Handley's observations (referred to in Cripps' paper above) are quoted by Mayo. These show that carcinomatous implantation may be found in the bowel, 6 inches above the visible border of the disease. Reference is made to Fagge's report upon the downward extension of carcinoma in which there was extensive involvement of the lymphatics of the anal canal. This was evident only after microscopic examination, there being no gross evidences of the spread. Mayo agrees with

¹ Arch. gén. de chir., 1912, vi, 6.

² Langenbeck's Archiv, Band xcvi, Heft 3.

³ Annals of Surgery, August, 1912, p. 240.

Fagge that where the carcinoma has its origin in the rectal ampulla, the entire anal canal should be removed.

For all these reasons, a wide eradication of the disease is imperative. At least 6 inches of apparently sound bowel above, and no less than 2 inches below the local tumor should be removed, together with all the surrounding fat and glands. A permanent colostomy in some situations is the price paid for a cure.

The few fortunate cases in which the disease was discovered early, and was still strictly local, justified a limited resection of the rectum with direct suture in continuity. These cases constitute most fortunate exceptions to the general rule.

Failure to remove the disease in an orderly manner and not the natural tendencies of rectal cancer, is chiefly responsible for the large number of recurrences after so-called radical operation.

All high rectal and terminal sigmoid growths are considered in one group as rectosigmoid. These form a considerable percentage of carcinomas of the rectum, and, when localized, are extremely favorable for curative operation. In a limited number of cases, the sigmoid can be anastomosed to the lower rectum by the tube method after resection has been performed. However, in the majority of cases, involvement is so extensive that the entire rectum and lower sigmoid must be removed. Colostomy through the left rectus muscle, as advocated by Lilienthal, has been found by the Mayos to give good functional results, and is to be preferred to an artificial anus in any other situation, for it can be controlled by a simple abdominal binder, because the weight of the abdomen in the bandage exerts a gentle pressure which is sufficient for closure. The rectus muscle is as controllable as the biceps, and temporary voluntary control is often obtained, even against gas and fluids.

Preliminary colostomy, to be followed later by radical removal, is strongly advocated; it allows thorough evacuation of the bowels and careful cleansing of the distal fragment before undertaking the second operation. The importance of this step cannot be overestimated when it is considered that 90 per cent. of the deaths following operation are due to sepsis.

Carcinoma of the rectum and rectosigmoid remains a local condition until late. Mayo has never seen a case in which a locally removable carcinoma in this situation has been inoperable because of glandular metastasis alone. Cases with involvement of the liver, although the local growth was removable and fairly free from glandular metastases, were not uncommon, especially in the young. Peritoneal metastases and implantation carcinoma in the mucous membrane above and below the primary growth occurred sometimes in cases which were locally operable.

Intraperitoneal exploration should constitute the first step in

operating on cancer of the true rectum and rectosigmoid, and not until the disease be viewed from above, can the question of rectal conservation be settled. In many cases, rectal examination will not determine whether the disease is locally removable. In the very obese, cachectic, and those in poor physical health from general diseases, Mayo prefers a single operation by the perineal or sacral route, even though an occasional patient may be operated upon radically who has abdominal metastasis unknown to the operator. Inoperability is usually due to extension anteriorly to the genito-urinary organs. Involvement of the peritoneum and the muscular coats of the bladder is not unfavorable to operation, and, on a number of occasions, part of the bladder wall has been removed down to the mucosa, with good results. When the mucous membrane of the bladder is affected, and there is mechanical difficulty in micturition, an operation is not only futile, but also has considerable mortality.

Involvement by direct extension to the uterus does not constitute inoperability. In 5 cases, the uterus, with both ovaries and tubes, was removed at the same time with the rectum. However, carcinomatous involvement of the ovaries and pelvic peritoneum renders the prognosis much less favorable. The same may be said of involvement of the prostate and seminal vesicles.

In a number of cases, the ureters were dissected from the bladder to the brim of the pelvis, after which they were smeared with vaseline and dropped back into proper position. The same free dissection was done in hysterectomies, according to the method of Wertheim. In none of these cases did a ureteral fistula occur. No gauze was allowed to come in contact with the denuded ureters.

The statement that most cases of cancer are inoperable nine months after the beginning of symptoms is an error. It was found at the Mayo Clinic that a number of cases, in which the symptoms had existed for more than two years, proved to be in excellent condition for operation. As said before, "cancer of the rectum is a slow process and remains local for a long time, and this accounts for the reputation of colostomy as a palliative operation."

The radical operation may be divided into 2 classes: (1) Those through a perineal or posterior incision done at one sitting; (2) those through the abdomen, or through the abdomen combined with a perineal or sacral removal in (a) one or (b) two stages. Each of these has certain indications and advantages, and consequently justifies a brief review.

I. OPERATIONS THROUGH THE PERINEUM OR THROUGH A POSTERIOR SACRAL INCISION DONE AT ONE SITTING. (a) *Purely local operations* were done in 5 cases in which a carcinoma the size of a filbert or a bean was found in patients with few or no rectal symptoms. The discovery of these growths was due to the routine digital examination of the

rectum in all patients coming to the Mayo Clinic complaining of abdominal or pelvic trouble.

(b) *Cripps' Perineal Resection* was done in another small group of cases for carcinoma involving the anal canal. The tumor, with a good margin of skin around the anus, the sphincters, and a wide area of fat, the anal canal, and a sufficient amount of the ampulla of the rectum, were removed. The rectum above was not disturbed, and there was no attempt made to unite the skin to the stump of the rectum. In this class of cases it is advised to remove the inguinal glands.

(c) The *Quenu-Tuttle Perineal Resection* is indicated in very fleshy, elderly females in whom any kind of an abdominal operation is fraught with difficulty and danger, and also in patients who are cachectic and anemic. These patients are operated on in the perineal position through a posterior, straight incision with or without removal of the coccyx. A rapid dissection of the rectum from the hollow of the sacrum is carried out. When feasible, the closed stump of the sigmoid is drawn through the anal canal, which has been stripped of its mucous membrane, and is fastened in place. The stump is not opened for from twenty-four to seventy-two hours after operation, as recommended by Peck. This increases the chances for primary union.

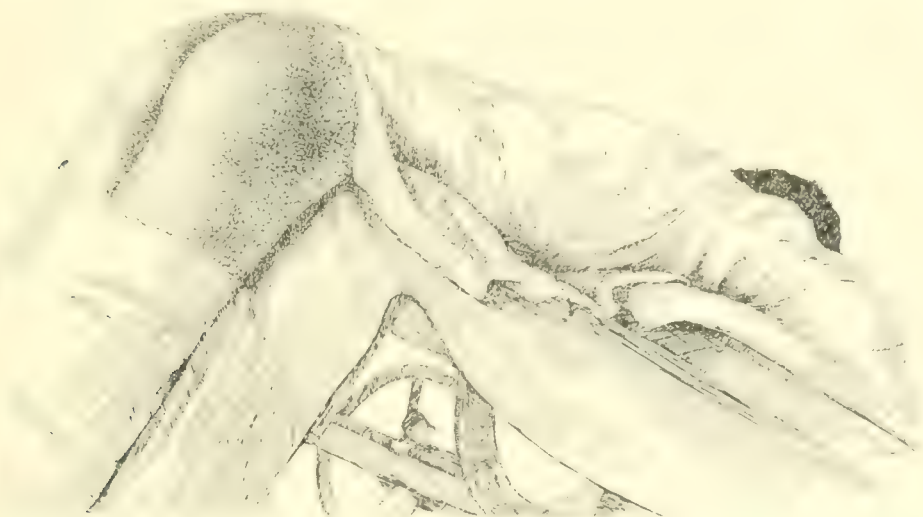


FIG. 97.—Patient in reverse Trendelenburg posture for excision of the rectum.
(Mayo.)

(d) The *Posterior Resection of the Kraske Type* is indicated in fleshy males, or in females with strictly localized growths situated well above the anal canal. These patients are operated on in the reversed Trendelenburg position (Fig. 97). An incision 8 or 9 inches long is made posteriorly in the midline from the upper sacrum to the anus. The coccyx and fourth and fifth sacral vertebrae are removed. In removing these vertebrae, the bone section may be made slightly concave from below upward, as done by Hochenegg (Fig. 98). The sacral operation is the operation of choice for the actual removal of the rectum, whether

as a primary operation, or as a second stage of the abdominosacral method.

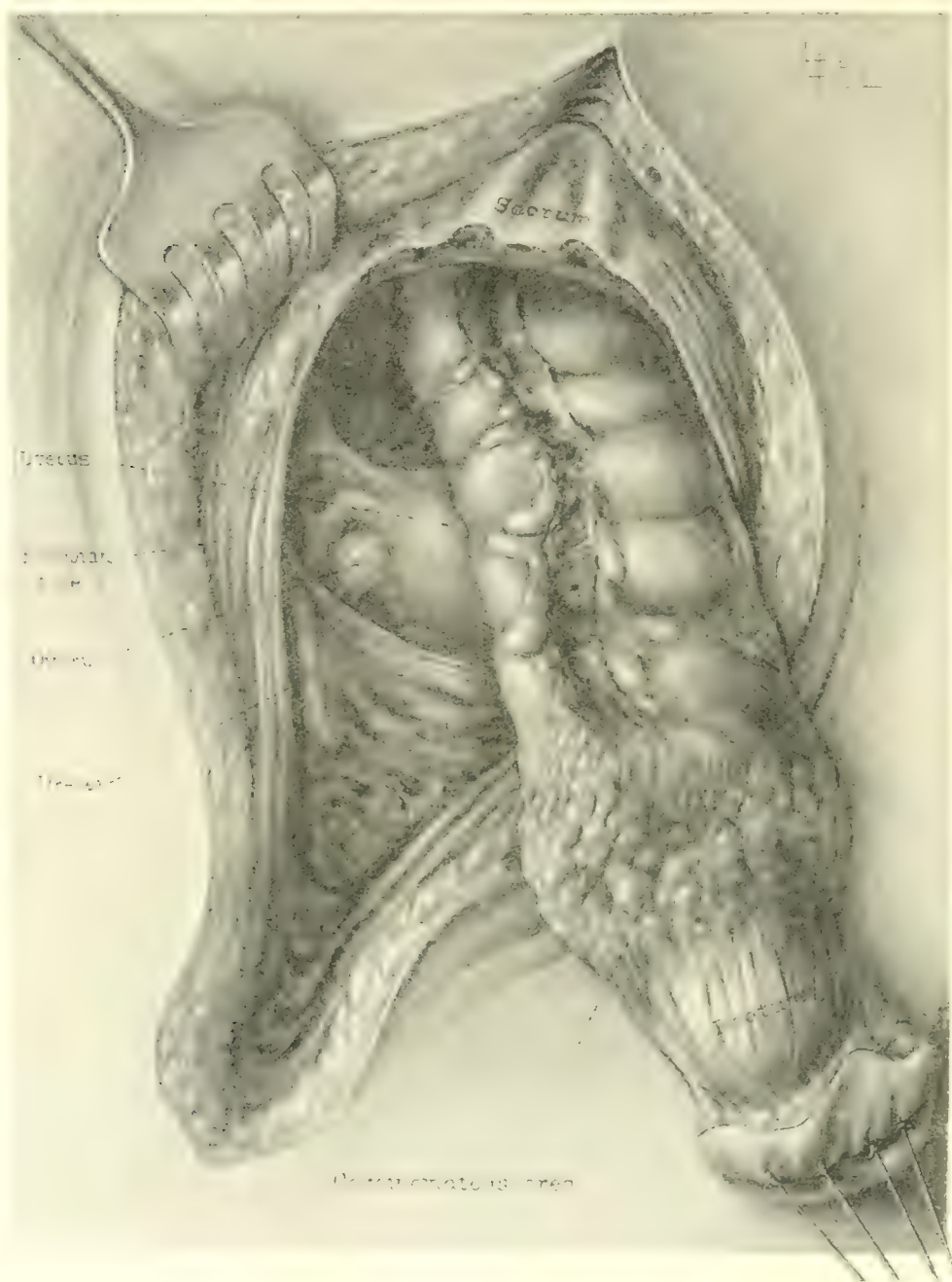


FIG. 98.—Posterior removal of rectum. Operation may be completed (a) by a sacral anus, (b) by closure of the end of the sigmoid if secondary to abdominal colostomy, (c) by removal of the entire rectum and sigmoid to the point of division if the sigmoid is divided. (Mayo.)

II. ABDOMINAL AND ABDOMINOPERINEAL OPERATIONS. (a) *Those done in one stage* constitute the ideal method of treatment. Mayo says, "I am confident that were this method applied in all cases, the mortality would be reduced one-half." A number of his cases subjected to this operation could not have been done in any other way, and otherwise would have been hopeless. The upper rectum and lower sigmoid were involved nearly to the promontory of the sacrum.

In all, a complete dissection of both ureters was necessary. Four of the patients had previously been operated upon, and a colostomy had been made because their condition was considered hopeless. In 2, a loop of adherent small bowel was coincidentally resected, and, in 2 others, the uterus was found involved and was removed. The Mayos have had a number of five-year cures in cases with such advanced carcinoma. They proceed as follows:

The patient is in the Trendelenburg position; a median hypogastric incision reaches from the umbilicus to the pubes. The sigmoid is drawn out, and the abdominal cavity is packed off with gauze. The sigmoid is clamped in two places at least 6 inches above the growth, firmly tied, and divided. The ends are sterilized with the actual cautery. The inferior mesenteric artery or the superior rectal, depending on the point of division, is tied. Both ureters are identified and separated, the peritoneum rapidly divided, and the entire cavity of the sacrum rapidly freed. Usually it is necessary to tie the middle sacral artery. If overlooked, the lateral sacral arteries may be the cause of troublesome hemorrhage. In regard to the middle hemorrhoidal arteries, it is usually sufficient to apply clamps to them for a few minutes; bleeding seldom follows their removal. The separation of the sigmoid and rectum is carried down to the levator ani muscles. From this point, the technique may be varied.

When the patients are in poor condition, an angular clamp can be applied to the lower rectum at its deepest portion, and that part of the bowel above the clamp removed, division of the gut being accomplished by the actual cautery. Such a clamp can be left in place with the handle projecting from the abdominal wound. The rectal space is then packed with iodoform gauze brought out alongside of the forcep's handle. Rubber tissue is used to prevent adhesion between the gauze and the intestines and omentum. The proximal end of the sigmoid is brought out through a wound in the left rectus muscle to form a permanent colostomy.

When conditions are more favorable, removal of the rectum is completed through the perineum.

In a number of cases it was feasible to bring the proximal end of the sigmoid down through the anal canal which had been denuded of its mucous membrane (Fig. 99).

In other cases in which the growth lay higher up, anastomosis was accomplished by the tube method. (Reviewed on p. 129 of *PROGRESSIVE MEDICINE* for June, 1911.)

In one case, marked obstruction was present. A lateral iliac colostomy was made, and, a week later, the rectosigmoid was removed through the abdomen and anastomosed by the tube method. Here the true rectum was intact.

In other cases, a permanent colostomy was made, the peritoneum

was closed across the bottom of the pelvis as well as possible, and below this the cavity of the pelvis was packed with iodoform gauze, the ends of which were brought out through the perineal incision.

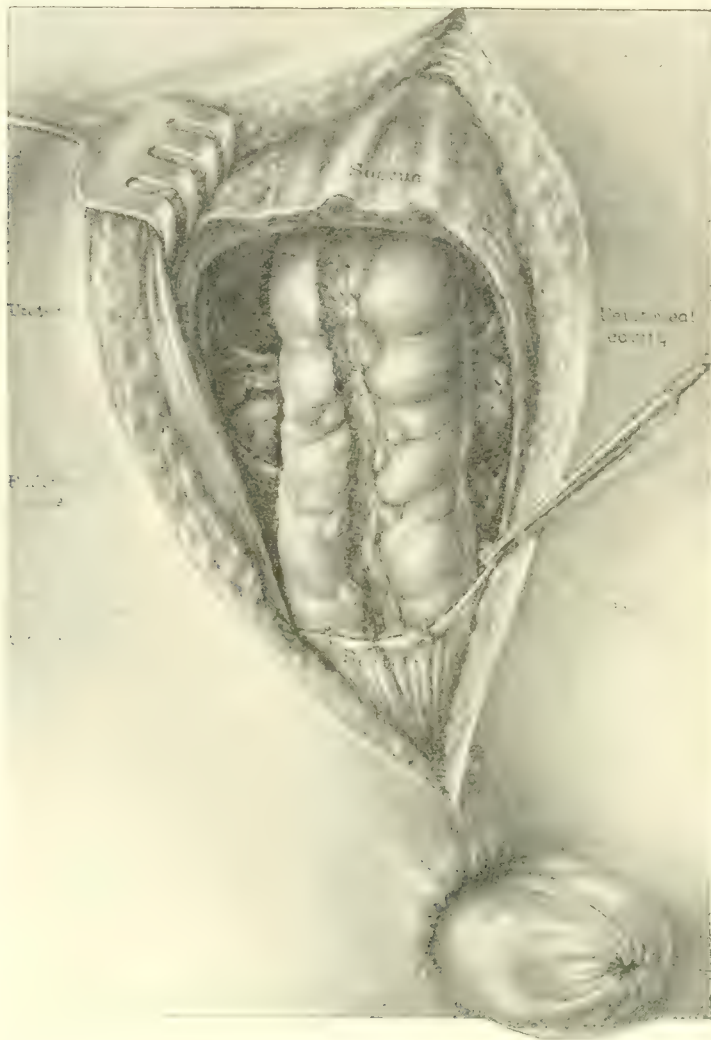


FIG. 99.—Terminal muscular rectum conserved, mucous membrane removed, and end of sigmoid pulled through and out of anus. End of sigmoid left closed temporarily by a purse-string suture. (Mayo.)

(b) *The combined abdominosacral operation in two stages* has much to commend it, and has a mortality of less than one-half that of the abdomino-perineal combined operation in one stage. The ability to cleanse the lower segment, and the relief of obstruction which a preliminary colostomy makes possible, are of the greatest importance. This method also permits the removal of tumors of the most extensive description from the rectum proper, a situation in which the abdominoperineal combined operation affords insufficient access. Depending on the local condition, in from seven to twelve days following a preliminary colostomy, one of two methods can be employed:

1. Either the growth is removed by the Kraske method through the sacral route (Fig. 98), the end of the sigmoid being closed by suture and

remaining as an appendage to the colostomy from which mucus can escape, or,

2. When the growth extends high on the lower sigmoid, the midline incision is made suprapubically, the sigmoid is brought up and divided between two ligatures, and both ends are sterilized (Fig. 100). The end



FIG. 100.—First stage of abdominosacral operation, division of lower sigmoid and permanent colostomy. Second stage, removal of entire rectum and sigmoid to point of division from behind. (Mayo.)

of the proximal sigmoid is brought out through the left rectus muscle as a permanent colostomy. The distal portion of the bowel is freed above as far as possible by block dissection, and is then depressed into the pelvis. The peritoneum is closed down and over the top of the

mass. A tube is inserted into the lower fragment through the natural anus, to carry off discharges and to enable cleansing by gentle irrigation. Six or seven days later the entire lower fragment is removed by the Kraske method. The patient should be kept on the side after the sacral operation, not on the back. This operation is not indicated in the very obese, or in those with obstruction. It has a higher mortality than when part of the sigmoid is left as an appendage to the colostomy. The rectum can be dissected by the sacral route with as much precision as in the cadaver, and this operation is a suitable procedure for practically all growths of the rectum and rectosigmoid. Its greatest advantage lies in the fact that, in suitable cases, if a temporary colostomy be made to divert the fecal current until satisfactory union of the upper and lower segments has taken place, complete restoration of normal function may confidently be expected.

Mayo says, "We are today operating upon cases which three years ago we would have considered entirely beyond the reach of surgery, because experience has shown that, by block dissection, a cure can be obtained in a goodly percentage of cases."

THE LIVER, BILE PASSAGES, AND PORTAL VEIN

The Anatomy of the Hepatic Artery is described with great detail in an 800 page monograph upon the anatomy of the celiac axis and its branches by P. do Rio-Branco.¹ Variations in distribution and anastomosis are given, with a wealth of detail. While they are too extensive to be fully reviewed here, a few facts about the hepatic artery which are of distinct surgical interest will be mentioned.

The hepatic artery crosses in front of the common duct in 20 per cent. of cases; in 12 per cent. of the cases, the right terminal branch of the hepatic artery originates from the superior mesenteric artery and takes its course to the liver behind the main structures of the gastro-hepatic ligament. In 15 per cent. of cases, a branch runs from the gastrica sinistra artery to the left lobe of the liver. Ligature of this branch would naturally lead to necrosis of the liver area supplied by it. In the distribution of the right branch of the hepatic artery, the following additional facts are to be noted: There is a triangle bounded on the left by the hepatic duct, to the right and upward by the end of a quadrate lobe nearest the hilus, to the right and downward by the cystic duct and neck of the gall-bladder. In this triangle lie the right branch of the portal vein, the corresponding branch of the hepatic artery, and a small branch from the hepatic artery to the right hepatic duct. All these structures may easily be injured in the course of

¹ Reviewed in *Zentralbl. f. Chir.*, 1912, No. 32, p. 1098.

freeing adhesions around the neck of the gall-bladder. The cystic artery originates from the right branch of the hepatic in about 88 per cent. The hepatic duct or the common duct, as the case may be, is crossed in front by the right branch of the hepatic artery in 12 per cent., and the cystic artery in 27 per cent. of cases. The common duct is crossed in its retroduodenal portion by the gastroduodenal or pancreaticoduodenal artery. It is, therefore, advised that palpation be made previous to incision to avoid injuring any arterial branch which might be situated on the anterior surface of the duct. Incision of the common duct should not approach closer than to within 1 cm. of the head of the pancreas. To obtain exposure of the biliary passages and adjacent vascular structures, it is advised to open the peritoneum on the anterior aspect of the hepatoduodenal ligament close to the duodenum.

Diffuse Peritonitis from Acute Cholecystitis without Perforation. Three cases are reported by Riedel.¹ All were in women with chronic cholelithiasis; 2 were pulseless on admission and died without operation. The third had a perceptible pulse, was operated on, and recovered. In none of these cases was there any perforation. This spread of inflammation is analogous to the occasional cases of acute appendicitis in which local abscess or diffuse peritonitis are present, although the inflamed appendix has no perforation.

Cholecystostomy versus Cholecystectomy. In his most recent article on gallstones, Moynihan,² of Leeds, summarizes the views held by surgeons, both here and abroad, regarding this much-discussed question. He states that the surgeons of America and of England lean toward cholecystostomy, while continental surgeons, most of whom follow the lead of Kehr, incline to the routine removal of the gall-bladder and drainage of the hepatic duct. Moynihan believes this diversity of opinion is accounted for by difference in material. According to the English and American view, it is believed that the diagnosis of gallstones can be made at an early stage of the disease, at which time the gall-bladder is but little affected, and the cystic duct is still patent. If such a gall-bladder is opened, relieved of stones, and drained, it may confidently be expected to return to its normal condition and to perform its functions as well as ever.

On the other hand, the continental view seems to be that the early recognition of gallstones is not yet possible, and that, when a diagnosis of gallstones has been made, even then operation should be reserved for cases in which the cystic duct is blocked and a hydrops or empyema has developed, or for cases of recurring cholecystitis, or when there is a chronic occlusion of the common duct. For these conditions, it is held that the gall-bladder should be removed and the hepatic duct

¹ Wien. klin. Woch., 1912, No. 4.

² British Medical Journal, January 4, 1913, p. 8.

drained. Moynihan believes if the former view be adopted, operations will be more numerous, with the advantage that each operation will be simpler in character, convalescence will be quicker, the death rate lower, and complete and permanent recovery more frequent. While Moynihan is, therefore, an advocate of cholecystostomy, whenever this is justified; in practice he finds that he is compelled to remove the gall-bladder with a frequency far greater than he desires.

Cholecystectomy is indicated when the walls of the gall-bladder are so modified by disease that neither the storage nor the expulsion of bile is possible, and when the canal through which the bile is emptied is to any degree obstructed. An additional indication is furnished by the presence of a tightly impacted solitary stone in the cystic duct. Experience has shown that the pressure of this stone usually causes ulceration of the adjacent mucosa, which cicatrizes after the removal of the stone and forms a stricture. Such strictures are one of the common causes for a second operation.

Further, the gall-bladder should be removed when it is filled with tiny beads, many of which are so buried in the mucosa that they cannot be disturbed, or when the mucosa gives a "strawberry" appearance. Hence, although theoretically he is in favor of cholecystostomy, we find that, practically, he is as much an advocate of cholecystectomy as many of the conservative German surgeons.

Moynihan's remarks upon latent gallstones bear repetition. He says, "That whatever latency may be invoked in respect to the clinical declarations of gallstones, there is certainly none attaching to their pathological manifestations. When patients are operated upon after undergoing one or more 'cures,' extending over several years, it is at once evident that though symptoms have been kept in subjection, insidious morbid changes have been steadily progressing, changes which may involve the gall-bladder, the liver, duodenum, stomach, or pancreas; and, of these, the last is certainly not the least serious."

He therefore holds that, "when once a diagnosis of gallstones has been made, operation is always indicated unless there are grave reasons forbidding resort to surgery. Reasons should not be asked to support a plea for operation, but to justify any other course than this. All things considered, surgical treatment is far safer than medical treatment; it is curative, not palliative; it is permanent, not temporary. No one nowadays treats a vesical calculus by other procedures than operation, yet one still hears a voice raised against the surgical treatment of stones in the gall-bladder, though these can be recognized almost as certainly as vesical calculi, and although they give rise to suffering equally terrible, their consequences are at least as serious, though they can be removed with greater safety, and though the chances of recurrence are far less."

Primary Closure of the Abdomen after Simple Cholecystectomy, Cholecystostomy, or Choledochotomy, in certain selected cases, has been consistently advocated both by Garrè and Rotter.¹ The latter has laid down the following rules: (1) All peritoneal defects must be covered; (2) there must be no purulent infiltration or gangrenous areas present; (3) an absolute hemostasis is necessary. To accomplish this purpose, a subserous cholecystectomy is made, with subsequent suture of the peritoneum covering the bed of the gall-bladder. The peritoneum over the cystic duct is split down to the common duct. If the cystic duct is healthy, it is kinked on itself and sutured in this position. The overlying peritoneum is then closed. Should the cystic duct be found diseased, it is extirpated and its stump is drained. There were 95 cases, in 16 of which peritonitis was present. One patient died of erysipelas. Autopsy showed the abdominal cavity to be in good condition. The rest did well.

Capelle,² of Garrè's clinic, gives the following indication for primary suture of the common duct: When a few small concretions or large solitary stones are found in the common duct, and when the upper bile passages are free from stone. There were no deaths attributable to the suture. Sixteen cases are reported, with no recurrence. When doubt exists, a drain should be led down to the suture line.

Primary closure of the gall-bladder is also advocated under similar indications. The advantages claimed for this are that the gall-bladder retains its normal form and function, and does not shrink as after cholecystostomy.

Relapse in Gallstone Cases and its Treatment. In this section last year, the views of Naunyn regarding cholangitis were discussed. It was held that the pain, fever, icterus, and swelling of the liver and gall-bladder, were evidences of a cholangitis, usually in the presence of gallstones, but not infrequently without them. A. G. Gerster,³ in a paper read before the Chicago Surgical Society, April 5, 1912, without committing himself absolutely to the standpoint of Naunyn, agrees in the main with his ideas, and states that the clinical symptoms of infectious cholangitis cannot be differentiated from those of calculous biliary disease. Stones may be present without biliary colic, and biliary colic often appears without any calculi. While calculi may aggravate the symptoms, the intrinsic and essential factor is the cholangitis, which often exists before stones are formed, and may continue after their removal.

Everything which relatively or absolutely obstructs the expulsion of bile will cause persistence of cholangitis and biliary disturbances. Thus, among the intrinsic causes of relapse are mentioned stricture of

¹ By his assistant, Goldman, Berlin. klin. Woch., 1912, No. 35.

² Bruns, Beitr. z. klin. Chir., 1912, Band lxxvii, Heft 3, S. 681.

³ Surgery, Gynecology, and Obstetrics, November, 1912.

the common duct, external pressure from adhesions from the enlarged head of the pancreas or from tumors, but *the chief cause of relapse in gallstone disease is the leaving behind of undetected stones.* The author's remarks, based upon his own experience, readily explain how easily stones may be displaced into the dilated hepatic duct, and there escape notice and thus furnish the source of future trouble. He states that external palpation of the cystic and common ducts is a most unreliable test of the absence of calculi. He tells of a case in which a good-sized calculus (1 cm. wide, 2 cm. long) was felt by him in the duodenal end of the dilated common duct. An assistant palpated the duct, which was then opened. The stone had vanished. After considerable search, it was found impacted in the right branch of the hepatic duct. The method of dislodgement was explained as follows: Compression of the distended duct caused a displacement of bile to the right and left of the compressing finger, with additional distention of the walls of the ducts except at the actual point of compression. If the stone slipped from under the finger simultaneously with the displacement of the bile, it might be carried either toward the papilla, which was of no significance, or toward the hepatic duct at a moment when the latter and its branches were dilated *ad maximum*. As soon as the palpating finger was removed, the degree of distention lessened, perhaps sufficiently to hold and retain the stone in its new position. It was pointed out that if this readily occurred in the case of a large stone, it might still more easily happen in the case of smaller ones. For this reason, Gerster strongly recommends that a distended bile duct should be opened before palpation, because the rush of escaping bile tends to carry all movable stones toward the vent produced. There is no backward displacement into the hepatic duct or its branches. Furthermore, palpation of the ducts freed from their liquid contents is far more effective.

The question of cholecystostomy *versus* cholecystectomy crops up in his article. Many surgeons maintain that the gall-bladder should be left whenever possible, in order to serve as a guide in locating the common duct should subsequent operation be necessary. This belief has been made a justification for preserving permanently damaged gall-bladders. Gerster is convinced that this line of argument is unsound. He states that obstruction of the common duct is rarely the cause of troublesome adhesions, while, in the vast majority of cases, the presence of an infected gall-bladder will produce close, extensive, and very troublesome adhesions. These will not yield to blunt dissection, but will require the perilous use of sharp-edged instruments. He tells of 5 secondary operations upon the common duct after previous cholecystectomy, in every one of which the exposure of the common duct at the second operation was easy. In 1 case in which a cholecystostomy had been done, the damaged gall-bladder was

found surrounded by very dense adhesion, rendering the exposure of the common duct difficult.

Because of his experiences, Gerster concludes that every dilated common duct should be opened and drained, and that palpation should *follow* incision of the common duct, not precede it. All cicatricial deposits in the gall-bladder or cystic duct justify a cholecystectomy, likewise the presence of many small stones, even though the cystic duct be patent. Lastly, the presence of a damaged gall-bladder is an impediment, not an aid, to the subsequent exposure of the common duct, whereas absence of the gall-bladder does not constitute an important adverse factor in a subsequent exposure of the common duct. E. McD. Stanton's opinion that surgical interference is not advisable in the presence of non-calculous icterus because of the poor results obtained by surgeons in the treatment of this condition, is replied to by Gerster, who points out that there is no reliable criterion to determine whether a biliary colic with fever and jaundice is calculous or non-calculous. Further, the fact that 46 per cent. of permanent cures were obtained by the surgical treatment of non-calculous disease, as stated by Stanton (Ochsner's statistics), is not regarded by Gerster as an unfavorable sign, but is held by him to be encouraging. He says: "Having once acquired the conviction that the fundamental factor of biliary colic and hepatic fever is infection of the bile, causing inflammation of the walls of the bile duct, then, incision, drainage, and irrigation will be accepted as necessary steps of a rational treatment. . . . To what extent the surgical principles of drainage and irrigation can safely be employed for the cure of graver forms of biliary disorder, future investigation and experience must teach us."

The Following Details in Palpation of the Common Duct for Stone are recommended by Heidenhain.¹ After exposure of the gall-bladder and foramen of Winslow, the operator should step to the left of the patient and introduce his left index through the foramen of Winslow. The thumb lies upon the common duct, and thus larger stones can easily be palpated up to the hilus of the liver. Should stones be suspected in the retroduodenal portion of the common duct, the left index loosens the duodenum from behind at the lower margin of the foramen of Winslow, thus making the common duct readily accessible to palpation. Extraction of stones from this retroduodenal portion of the common duct can frequently be made by the aid of this method, thus avoiding transduodenal attack. An opening is made in the anterior wall of the free portion of the common duct. Suitable forceps are introduced downward into the retroduodenal portion where its action can be controlled and aided by the left thumb and index finger, as just indicated. Heidenhain has performed only one transduodenal operation for stone since 1897.

¹ Zentralbl. f. Chir., 1913, No. 3, p. 90.

The Prognosis in Gallstone Disease is discussed by Stanton¹ in a paper containing many interesting ideas and facts. The general incidence of gallstones seems to be in the neighborhood of 7 per cent. Of 19,000 odd autopsies at Erlangen and Munich, gallstones were found in 7.8 per cent. In 667 post mortems at the Bender Laboratory, gallstones were found in 7.2 per cent., while in 1244 women operated upon for uterine myomas by Mayo, 7.1 per cent. were found to have gallstones.

"It was formerly thought that the stones found at autopsy had been for the most part 'silent,' and had produced no symptoms during life, but this is now known to be due to the fact that autopsy patients cannot relate their symptoms. In our own work, we have frequently found entirely unsuspected gallstones when operating for other conditions, but, on questioning the patients afterward, we have never failed to elicit a clear history of gallstone symptoms definite enough to have warranted a diagnosis had the facts been ascertained before the operation. Similar observations have been made by Moynihan, Mayo, and many others."

As regards mortality, Stanton's own statistics show that, in 90 cases observed for a period of three years, there was a mortality of 6.6 per cent. under medical treatment. In the 1667 autopsies at the Bender Laboratory, 120 subjects were found to have gallstones. Of these, but 10 per cent. were found in which death was directly due to gallstone disease.

Chronic cystic duct obstruction was the most common complication which brought the patients to operation. Next to this came adhesion, producing more or less continuous discomfort.

By a medical cure is meant a relatively symptomless quiescent period lasting for a longer or shorter time. Under the treatment given at Carlsbad (practically the best medical treatment known), 72 per cent. of cures are obtained. As to surgical cures, by which is meant a complete and permanent cessation of all symptoms referable to the biliary tract, or the region of operative interference, Stanton says, "A personal study of the end-results in 245 operative cases has convinced me that we can safely estimate the complete cures at over 80 per cent., while a majority of the remaining patients are so greatly benefited as to be well pleased with the operative relief."

Stanton believes: That the most favorable cases are those in which the stones are still confined to the gall-bladder (the results are satisfactory in approximately 95 per cent. of these patients); that overlooked stones are probably the most important single cause of uncured patients; that if all obstructions within the biliary tract are removed, a cure is almost certain to follow. Lastly, that cholecystectomy should not be the operation of choice unless there is chronic cystic duct

¹ New York Medical Journal, December 14, 1912, p. 1224.

obstruction, or the gall-bladder is so diseased as to make its removal technically safer and easier than cholecystostomy.

A comparison of the mortality of the Mayos on one side (4000 cases) and that of 30 American State hospitals and 25 New York State hospitals on the other, gives the former 2.75 per cent. and the latter (1688 cases) 8.25 per cent. Stanton considers this 8 per cent. mortality too high, and believes it should be reduced by half. He goes on to say that "the mortality rate of the occasional operator will probably be reduced only when the public realizes that the gall-bladder mortality and end-results of the amateur or occasional operator are positively unpardonable. Many surgeons of recognized ability aver that their high mortality is due to the desperate state of the patients they are called upon to treat, but a close analysis of their deaths, whenever they are reported, yields convincing proof that most of these deaths are due either to bad judgment as to the time of operation, or to unnecessarily prolonged and complicated operative procedures."

All this is indeed true, but with the best of technique, the mortality of acute gallstone disease will always be somewhat higher in large cities than in a clinic far from the great centres, like that of the Mayos. The very acute cases one sees in the hospitals of any large city never reach such out-of-town clinics. A little further on Stanton says, "that emergency operations are not, as a rule, life-saving, and are not justified if a safer operation can be performed during a quiescent period." While there is no question about the advisability of operation in the interval when this is possible, I certainly do not agree with the idea that emergency operations are not life-saving. If one has seen a considerable number of emergency cases in which the tensely distended gall-bladder showed large patches of gangrene involving the entire thickness of the wall, and when a cholecystectomy was done with proper speed and gentleness, the postoperative course of such patients is in marked contrast to that of those operated upon after rupture of such a gall-bladder.

There is no question about the truth of Stanton's closing sentence that "at present the operative mortality in the hands of those really qualified to do this work is satisfactory, but, in the hands of the average operator, it is entirely too high."

Infection of the Bile Passages after Their Artificial Union with the Small Intestine doubtless occurs more frequently than has heretofore been supposed. Kausch¹ has recently called attention to such infection after cholecystenterostomy. Similar reports have been made about other methods of union; thus Ernst² has published the case of a woman, aged sixty-nine years, on whom a hepaticoduodenostomy was done. She had several attacks of pain in the region of the liver, accompanied

¹ Langenbeck's Archiv, Band xcvii, Heft 2 and 3.

² Hospitalstidende, 1911, No. 25.

by fever and chills, and finally died six months after operation. Post mortem showed the opening to be patent, the bile passages were distended and contained many small stones. A biliary cirrhosis was found upon microscopic examination.

Laméris¹ reports performing hepato-cholangio-enterostomy in a case with defect of the bile passages following removal of a carcinoma involving the hepatic duct. He excised a piece from the left lobe of the liver 2.5 by 6 cm. Both blood and bile flowed freely from the wound. The hemorrhage was stopped with the actual cautery. A loop of jejunum 40 cm. from the duodenojejunal junction was opened, and its edges sewed to the defect in the liver. The immediate result was good. Six months later the patient came again to the hospital in a cachectic condition. From then on the course was steadily downward until death occurred ten weeks later. At the post mortem, multiple abscesses of the liver were found. The loop of jejunum adherent to the liver was open. Upon pressure on the liver, ten small openings were seen to exude yellowish-green bile, proving that the hepato-enterostomy functionated eight months after its establishment.

The cholangitis, with multiple liver abscesses, probably resulted from this union of gut and bile passages.

Substitution of the Common Duct by a Drainage-tube. When the common duct was found impermeable and unsuitable for plastic procedures, Wilms,² of Heidelberg, has employed this method with success. It consists of sewing one end of a rubber drainage-tube into the hepatic or common duct, and implanting the other end into the stomach or duodenum by the Witzel method of enterostomy. In all of his cases (5), the operation was successful. The icterus subsided, and the stools became normal. In all of them, the destruction of the common duct had been caused by inflammation. The longest that any of these cases had gone after operation was fifteen months.

In this country Sullivan³ has developed a similar technique. A drainage-tube is tied inside the proximal end of the cystic or common duct, as the case may be, and the distal end of the tube, which should project through 2.5 cm. into the duodenum, is implanted by the Witzel method of enterostomy. The duodenal wall should be sewed over the tube for a distance of at least 2 cm. That part of the tube still visible is covered with omentum, which has been rubbed a little in order to increase its adhesive properties. When possible, Sullivan uses the distal stump of the common bile duct, by passing the drainage tube through it into the duodenum. The papilla is first dilated by passing suitable sounds of increasing size. When the distal end of

¹ Zentralbl. f. Chir., 1912, p. 1665.

² Report of the Heidelberg Clinic (Surgical) in Bruns' Beiträge f. klin. Chir., 1912, Band lxxx.

³ Journal of the American Medical Association, June 29, 1912, p. 2026.

the common duct cannot easily be found, Sullivan recommends opening the duodenum and inserting a probe through the papilla, thus readily indicating the location of the common duct. The drainage tube should have a lateral fenestrum so placed that the free outflow of pancreatic juice from the duct of Wirsung is possible.

The only pertinent case in a human being in this country was one of Brewer's.¹ Here the tube was not implanted according to the method recommended by Sullivan, but was simply fastened by a purse-string suture into an opening in the duodenum. The patient apparently died from cholangitis. There was no autopsy.

It remains to be seen whether this method does not predispose to ascending infection of the bile passages sooner or later, and whether stricture will not form in due course of time. In any case, it is simpler, and apparently no more likely to be followed by ascending infection than other unions of the bile passages and intestine. It is a distinctly valuable and novel addition to the surgery of the biliary system.

Radical Removal of Carcinoma of the Papilla of Vater. Kausch² has collected 19 cases in which this was attempted. Only 10 patients recovered from the operation, and, of these, but 1 remained free from recurrence longer than three years. However, in only 2 of the cases was a resection of the duodenum made. The rest of the operations were more or less local.

Kausch considers carcinoma of the papilla a relatively benign affection, because it reveals its presence early (icterus), and forms metastases late. In this respect, it is analogous to carcinoma of the appendix.

A two-stage operation is advised. In the first stage, a cholecyst-enterostomy is established, and the common duct is ligated. At the second operation, a gastro-enterostomy is made, the pylorus is closed blindly, and there is a transverse resection of the duodenum, together with the adjacent portion of the head of the pancreas. The stump of the pancreas should be implanted into the distal portion of the duodenum, or, if this cannot be accomplished without undue tension, the implantation should be made into the loop of gut which has been previously united with the gall-bladder.

Eck Fistula for Portal Obstruction. The ability properly to suture bloodvessels, according to the method introduced by Carrel, is no longer looked upon as a sleight-of-hand trick of the laboratory expert. It is rapidly becoming the property of general surgeons. The number of successful sutures of vessels in human beings is steadily increasing. Most of the operations with satisfactory outcome have been performed upon vessels of the extremities. The practical value of vascular suture in the field of abdominal surgery is clearly shown by Bernheim and

¹ *Annals of Surgery*, June, 1910.

² *Bruns' Beitr. z. klin. Chir.*, Band lxxviii, Heft 3.

Voegtlin's¹ recent description of a simple and safe method for establishing Eck's fistula for the relief of portal obstruction. Their experiments were carried out upon dogs. Anyone familiar with vessel suture knows that the technique in animals is far more difficult than in man. Nevertheless, these authors have shown that with their method the Eck fistula can readily be established under more difficult vascular conditions than are encountered in human beings, and that the establishment of such a fistula is compatible with life.

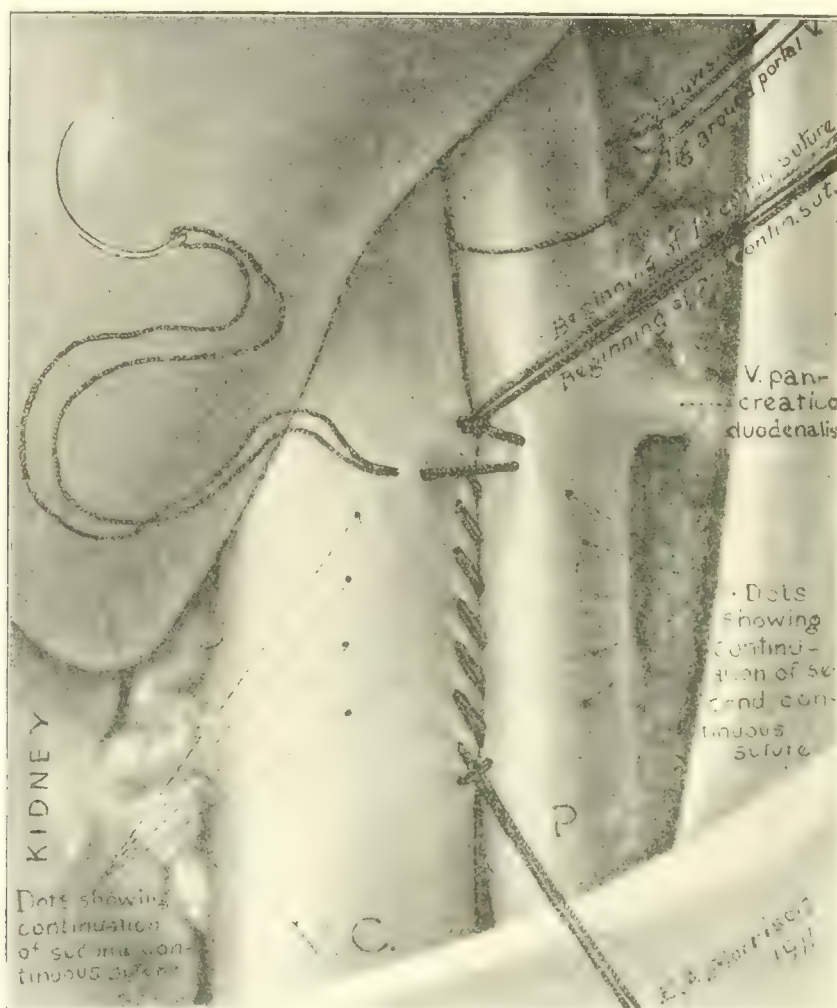


FIG. 101. —Bernheim and Voegtlin's method of establishing an Eck fistula. Posterior suture completed. Anterior just begun.

Before describing details of the technique, they state that it has always been a difficult matter to cut an accurate opening between the portal vein and vena cava after they have been united side to side. It has been almost equally difficult to control hemorrhage following the above procedure. The control of bleeding has been perfectly accomplished by a special suture (described below), and accuracy of incision has been obtained by the use of a specially designed pair of

¹ Johns Hopkins Bulletin, February, 1912, vol. xxiii.

scissors (Fig. 102). After proper exposure of the vena cava and portal vein, the left side of the vena cava is united to the adjacent side of the portal vein for a distance of about one inch (Fig. 101) by a continuous suture of double silk, threaded on a curved No. 3 French needle. The needle is passed through all the coats of both vessels, and very little hemorrhage occurs because the doubled thread is of such a size that it almost completely fills the needle hole. The slight bleeding which takes place is accurately controlled by gentle traction on the stitch previously placed. The suture is started above and continued downward, the ends being left long to be subsequently made use of as tractors.

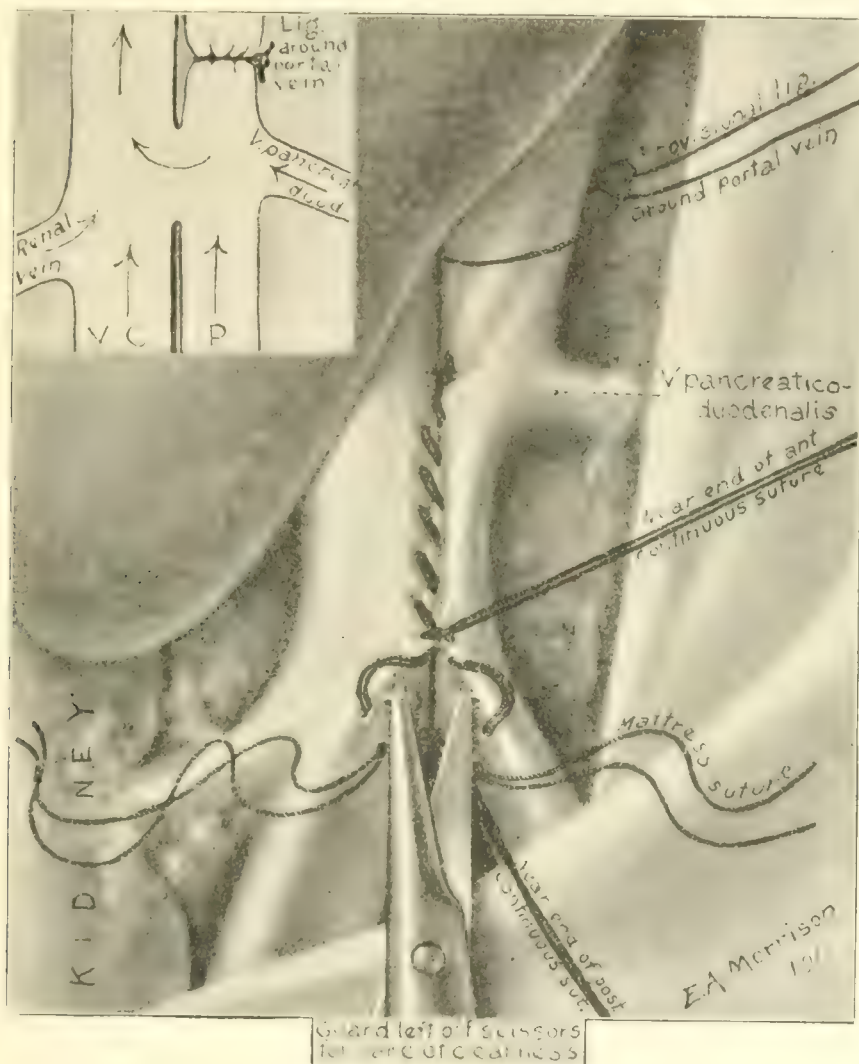


FIG. 102.—Sutures all placed. Insertion of scissors just begun.

Starting again at the top with another suture, just as in making a lateral anastomosis of the intestines, the portal vein is made to overlap the vena cava. This suture, also a continuous one, is brought down the outer sides of the vena cava and portal vein parallel with the first suture, as indicated in the dots in Fig. 101, for a distance of about three-fourths of an inch, when it is tied, the ends being left long.

In the space between the lower ends of the two continuous sutures, a mattress suture is placed, having one arm in the portal vein and one in the vena cava (Fig. 102). Between the arms of this suture, which is left loose and untied, the blades of the Eck fistula scissors are passed into the vessel, one entering the lumen of the portal and the other that of the vena cava (Fig. 102). If now upward traction (that is at right angles to the vessels) is put upon the near end of the anterior continuous suture, and if the guide of the scissors which is outside the vessels be kept absolutely parallel to the upper row of sutures, the blades, being open to their fullest extent, can be sent into the vessels up to the hilt (Fig. 60), without the slightest danger of cutting the upper or lower rows of sutures, or of puncturing either vessel laterally. A cut exactly 1 cm. long is then deliberately made, and the scissors withdrawn, the forefinger of the operator or assistant being slipped over the external hole made in the vessel by the scissors, and held there while the mattress suture, also of double silk, is tied. If this

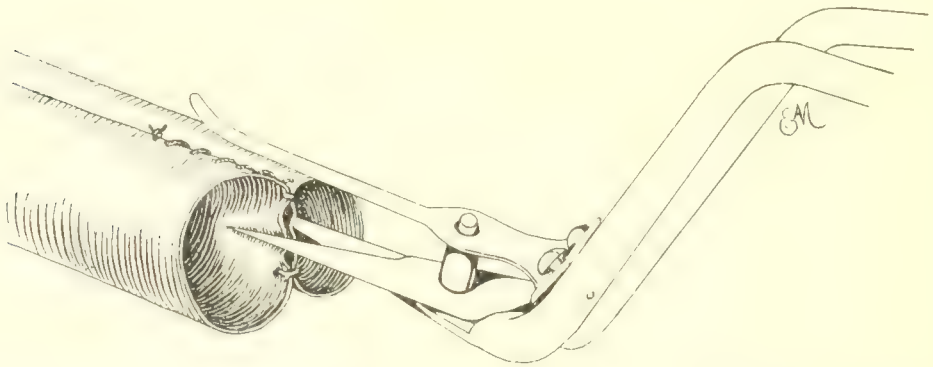


FIG. 103.—Illustrating how cut is made between two lines of sutures.

suture has been properly placed, the hemorrhage will be accurately controlled. The ends of the mattress suture may be tied to the ends of the continuous sutures if additional security is desired. However, this is rarely necessary.

Since using the special scissors there has not been a single fatality attributable to them, although the operation has been performed on more than 25 animals.

It is well known that an exclusive meat diet will cause symptoms of ammonium poisoning in dogs with Eck fistulas. Bernheim and Voegtlin, however, found that if bones were added to the meat there were no symptoms of intoxication. They were unable to offer a satisfactory explanation regarding this, but they suggested that the calcium phosphate of bone had some retarding influence on the rate of digestion and consequently on the absorption of ammonium salts from the intestinal canal; or, perhaps, the antagonistic action of calcium to ammonium salts may have been the deciding factor in preventing intoxication. Furthermore, it was found that on a mixed diet con-

sisting of milk, meat, and bread, the dogs will live for a long time without showing noticeable abnormality. Several of the animals were kept alive for more than ten months.

The details regarding the carbohydrate metabolism should be read in the original, likewise the findings in regard to bile formation and the hemolytic function of the liver in the presence of an Eck fistula. Here let it suffice to remark that the formation of bile pigments and bile acids was markedly decreased.

There is danger of intoxication by errors in diet in the human being with an occluded portal circulation, but this danger is remote, as shown by a case in which a thrombosis of the portal vein had caused complete obstruction, where, although the severe ascites required tapping every two weeks during a year, the nutritional condition, nevertheless, remained good. "It must be borne in mind that suture of the portal vein to the vena cava in human beings with a portal obstruction may be prevented by the presence of inflammatory or neoplastic conditions in the region of the hilus of the liver. However, the feasibility of the operation under anything like ordinary conditions is beyond question, provided the operator has acquired an adequate technique by previous work upon dogs and upon the cadaver." Naturally, the earlier a patient is operated upon, the better are the chances for success.

In Germany, the problem of establishing an Eck fistula for portal obstruction has also received attention. At the German Surgical Congress of 1911, Franke and Jerusalem both showed clamps like small intestinal clamps, which were designed to enable the establishment of lateral vascular anastomosis without hemorrhage—4 cm. of the vessel walls are included in the clamp. The openings made are 2 cm. long. The patient should lie on the left side. A huge incision is necessary in order to obtain the proper exposure. It runs from the centre of the abdomen across the rectus and oblique to the latissimus dorsi. This operation is not possible in the presence of hypertrophic cirrhosis because the Spigelian lobe obstructs the work.

At the German Surgical Congress of 1912, Rosenstein presented a woman, aged sixty years, on whom the operation had been done five months before (November 11, 1911). It had been his intention at the time to do the usual Talma operation, but the pendulous abdominal wall and the mobility of the liver to the left, afforded such favorable conditions, that he changed his mind and established an Eck fistula. Ligatures were passed behind the portal vein and vena cava above and below the site of anastomosis. No clamps were used while the suture was being made. It is a question whether the operation was successful, because at the time of presentation five months later, the patient still had to be tapped, although a little less frequently than before.

Jeger presented a three-bladed clamp at the same Congress similar to the Roosevelt clamp for gastro-enterostomy (Fig. 104). Fig. 105 illustrates the manner of its application.

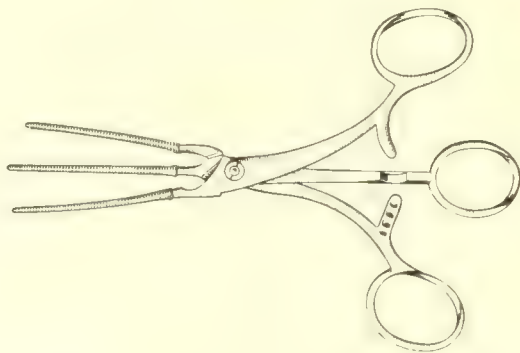


FIG. 104.—Jeger's clamp for holding vessels while establishing an Eck fistula.

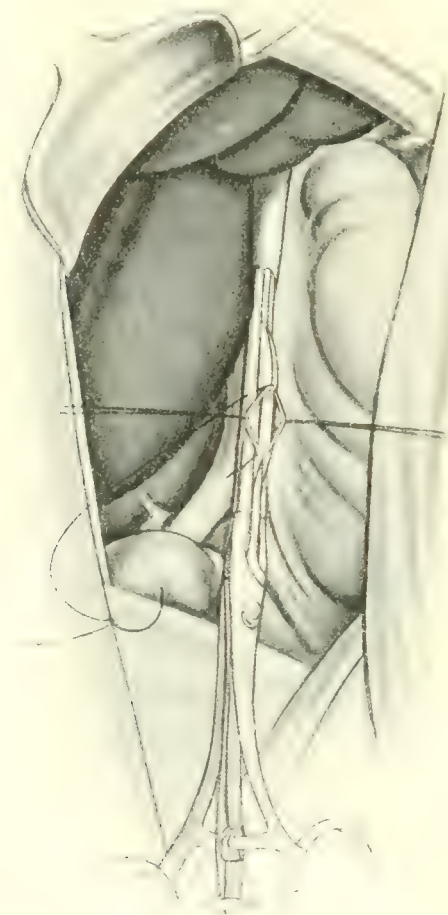


FIG. 105.—Jeger's clamp in situ. Posterior suture line completed.

Two theoretical considerations regarding the Eck fistula are of importance. In the first place, in case of bacterial invasion of the portal blood, the organisms will be carried directly into the general blood stream instead of first passing through the capillaries of the liver. The second consideration is embodied in the question of whether

perhaps the ascites is not due to a chronic peritonitis instead of to portal obstruction. The elimination of obstruction may therefore fail to influence the ascites.

Implantation of Omentum into Kidneys for Relief of Portal Obstruction. Isobe,¹ of the University of Kyoto, Japan, found in his animal experiments that the normal venous collaterals around the kidney do not afford a collateral circulation adequate to sustain the life of that organ after tying the renal vein. Further, that after decapsulation and surrounding the kidney with omentum, the collateral circulation established was better, but not good enough to avoid frequent necrosis of the centre of the organ, after cutting off the main venous return. (Both of these facts are very well known.) However, where implantation of the omentum was made between the halves of a nephrotomized kidney, such an extensive collateral circulation was developed, that, after fifteen days, not only the cortex, but also the central portions of the kidney remained alive and well following ligation of the renal vein. There was no disappearance or lessening of this collateral circulation up to seven months after the operation. The author of this method believes that there is far more hope for its success in portal obstruction than for the usual Talma operation. Torikata, of Kyoto, Japan, has tried this upon human beings with apparent success.

The details of a case treated by this method are reported by Mori,² from the clinic of Nagano, in Formosa, Japan. A man, aged thirty-seven years, suffered from ascites secondary to hepatic cirrhosis of malarial origin. Tappings afford only temporary relief. At laparotomy, the posterior parietal peritoneum was incised; the left kidney was luxated forward; the kidney was opened well into its central portion; the omentum was sutured into the kidney wound.

One month later a second laparotomy was made with similar exposure of the right kidney; partial decapsulation was done, and suture of the mesentery to the fibrous capsule.

Four and one-half months later, as ascites was still present, Ruotte's operation (suture of the saphenous vein into the peritoneum) was done on the right side; ten days later this was repeated on the left side.

Improvement followed; the ascites disappeared, and diuresis increased.

Nine months later, laparotomy was made purely for the sake of ascertaining intra-abdominal conditions. The mouths of the saphenous veins were obliterated; there were dense adhesions around the left kidney. It was concluded that the collaterals developed here accounted for the cure.

Two other cases are cited in which the omentum was sutured into the split kidney. One case died of gastric hemorrhage two days after

¹ Mitt. a. d. Grenzgeb. d. Med. u. Chir., Band xxv, Heft 3, S. 415.

² Deutsch. Zeitschrift f. Chir., Band cxiv, p. 75.

operation. The other case died of peritonitis and empyema some time after operation. Injection of the vessels showed development of new collaterals between the omentum and kidney.

Tentative Diagnosis of Aneurysm of the Hepatic Artery; Findings at Operation. A remarkable case with this title was published by G. A. Friedman.¹

A woman, aged thirty-five years, gave a history of measles and pneumonia and of excessive use of alcohol for a month each year in childhood. She had worried a great deal because of a serious accident to her son, and, eighteen months after this had occurred, she began to have violent paroxysmal pain in the right upper quadrant of her abdomen. The pain was sharp, shooting in character, and increased by the recumbent position. There was visible pulsation over the liver, occasionally expansile; this was accompanied by a systolic shock felt under the ribs. A throbbing sensation appeared later when the attacks of pain had become more frequent. The lower border of the liver was palpable and rounded. The Wasserman reaction was negative.

Gallstones, duodenal ulcer, malignant disease, neuralgia, visceral arteriosclerosis were all considered as diagnostic possibilities, and were in turn excluded.

Aneurysm of the aorta was excluded by negative x-ray plates and by the high-blood pressure in the dorsalis pedis as compared with the radial pressure. Moreover, the palpable liver and its changed border were to be explained.

The factors to be considered were: (1) Paroxysms of pain of neuralgic type; (2) an inconstant sensation of throbbing, appearing after the attacks of pain had been experienced for some time; (3) arterial liver pulse; (4) a comparative high blood pressure at an age when such pressure, especially in the female, should not be expected; (5) alcoholism in childhood; (6) long-continued worry and grief over an accident to the patient's son.

A tentative diagnosis of aneurysm of hepatic artery was made for the following reasons: Other conditions explaining the symptoms could be excluded; a definite history of abuse of alcohol in childhood was obtainable and a sclerosis of the hepatic artery in consequence of it could be assumed; unusual wear and tear of life were present in this patient, because of the acute and long-continued worry and grief over her child's misfortune; arteriosclerosis, as known, is frequently an expression of the damage done by long-continued psychic strain. The first attacks of pain could be explained by pressure of the dilated artery upon the hepatic nerve plexus, situated in the portal fissure. This plexus is a branch of the celiac, and the latter is connected with the brachial through the phrenic nerve and its branches. This might

¹ Medical Record, September 12, 1912.

explain the radiation of pain to the right shoulder and right arm. Jaundice was absent, because the bile ducts were not pressed upon, and the absence of pressure upon the portal vein explained the absence of ascites. The sensation of throbbing and the visible pulsation over the liver were, of course, directly due to the dilated artery.

Exploratory laparotomy was performed by Dr. Arpad Gerster, on April 9, 1912. The following is his report of the operative findings: "As soon as the margin of the lesser omentum was exposed, the hepatic artery became visible as a pulsating cylindrical body, having the diameter of a large goose-quill. It formed a loop with its convexity downward. Its proximal continuation could be distinctly followed by palpation of the celiac axis, forming a large loop with its convexity pointing upward, so that the whole vessel, as far as visible and palpable, represented a large Roman 'S,' its entire estimated length being six inches. A marked whirl could be felt on the gentlest contact with the vessel. The gall-bladder was normal, and was moderately distended with bile, which could easily be expressed into the common duct; no stones. The common duct was not distended and contained no stones (no palpable tumor) nor cicatricial ulcer.

"All the exposed structures, especially the duodenum, showed marked cyanosis. This was charged to the bad anesthesia. The margin of the liver was markedly rounded and thickened. No cicatrices. The stomach was much dilated by gases which were withdrawn by a tube. The index finger could easily be invaginated into the pylorus.

"The division of the aorta into the iliaes, instead of corresponding to the fourth, corresponded to the second lumbar vertebra. The caliber of the aorta and iliaes, and the coronaries of the stomach, was normal.

"*Diagnosis.* Dilatation and elongation of the hepatic artery. No aneurysm."

The patient made an uneventful recovery from her laparotomy.

The Emetine Treatment of Amebic Disease. Major Leonard Rogers, of the Indian Medical Service, is professor of pathology at the University of Calcutta. His previous communications on amebic disease have attracted widespread attention. In this section of *PROGRESSIVE MEDICINE* for 1911 (p. 140) the ipecac treatment of amebic disease was discussed.

In three recent articles¹ Rogers has brought out many interesting facts about the prevalence of amebic disease and the new emetine treatment for this condition.

He found that amebic disease is responsible for twice as many fatalities as bacillary enteritis in Calcutta alone, and, further, that a remarkable uniformity exists between the monsoon rains and the prevalence of

¹ *Lancet*, October 19, 1912, p. 1062; *British Medical Journal*, June 22 and August 24, 1912.

dysentery. This, however, affords no great probability of variation in the type of the disease likely to be met with in the wet and dry areas respectively. Rogers goes on to say that the long controversy regarding the relationship, if any, between dysentery and tropical liver abscess may now be taken as definitely settled. In 1902, he published an extensive series of data proving that the presence of dysentery at some time or other, and always, in his experience, of the amebic type, could be demonstrated in over 90 per cent. of liver abscess cases in Calcutta, if both a clinical history and a postmortem examination were available; but that in one-fourth of the cases the bowel ulceration was found only after death when no history of symptoms of dysentery were available during life, the colitis being latent and usually limited to the cecum. Since that time he has accumulated abundant further evidence in support of these statements, and now has postmortem records of over 50 liver abscess cases, in no less than 98 per cent. of which there was evidence of amebic dysentery, including scars of old ulcers.

Roger states: "We may, therefore, safely conclude that if there is a considerable liver abscess admission rate in any given area, amebic dysentery will certainly be widely prevalent, and will probably constitute a large proportion of the dysentery met with in that part of the country. Statistics in the British army show, for the whole of India, that 1 liver abscess admission exists to each 7 dysentery ones, which clearly indicates an extensive occurrence of amebic dysentery in the country as a whole."

In 1907, Rogers showed that amebic abscess of the liver was an easily preventable disease if it were detected by the blood changes in the febrile, presuppurative stage, and adequately treated with large doses of ipecac. The following three years the liver abscess mortality under ipecac treatment in the British Army fell to about 30 per cent. of its former prevalence.

Rogers writes: "Doubtless the principal cause of the vicissitudes of ipecac is the production of very disagreeable and exhausting nausea and vomiting by the large doses which are essential to obtaining its full curative effects in amebic disease. This serious drawback is only partially overcome by the present methods of giving the drug in salol- or keratin-coated pills, and the use of opium, chloral hydrate, or tannic acid to check vomiting. A year ago Vedder showed that emetine, the principal alkaloid of ipecac, has the power in high dilutions of destroying amebæ in broth cultures, although it is not clear that this was a pathogenic form, which most recent authorities have not yet been able to cultivate." Rogers, therefore, tested the effect of the soluble emetine hydrochloride on amebæ *histolytica* in dysenteric stools. He found that on placing a piece of mucus containing numerous active amebæ in normal saline solutions of this salt, "The pathogenic organisms are

immediately killed, and materially altered in their microscopic appearance, by a 1 to 10,000 solution, while after a few minutes they are rendered inactive and apparently killed by as weak a solution as 1 to 100,000." Rogers, therefore, decided to try if this powerful alkaloid could safely be administered hypodermically in the treatment of amebic disease. His experiments bore out these hopes. Different types of amebic disease were treated with uniform success. Among the varieties mentioned are: Acute hemorrhagic amebic dysentery in patients who could not retain ipecac; extremely acute amebic dysentery with marked thickening and tenderness of the bowel and a high leukocytosis; lastly, fatal gangrenous amebic dysentery in which the amebic infection was destroyed within sixty hours by emetine injections. Subacute forms of amebic dysentery, severe chronic dysentery of a three and one-half year's duration, were rapidly cured, as were acute hepatitis due to amebic disease, and amebic abscesses of the liver and spleen. These latter were treated by aspiration and injection of emetine solution (see below).

Since amebic dysentery can be rapidly, completely, and permanently cured by the emetine treatment, and the subsequent occurrence of amebic hepatitis and liver abscess rendered very remote or even impossible, the simple and early recognition of amebic dysentery from the closely simulating bacillary form has therefore become a matter of the most urgent practical importance.

In discussing the differential diagnosis of amebic colitis, Rogers says that if separate pieces of rosy blood-stained mucus constitute all, or nearly all, of the stool, he usually has found abundant ameba, while either thick, white pieces of mucus without blood, or small, transparent, raw, white-of-egg-like mucus intimately mixed with loose fecal matter, is suggestive of the bacillary disease, but none of these points can be solely relied upon in making a diagnosis.

In 90 per cent. of the cases, the amebæ are readily found by the microscope after one or occasionally two examinations. "Much has been written on the difference between the harmless *Amœba coli* with their lack of clear ectoplasm, well defined nucleus and small size; and the pathogenic *Amœba histolytica* with the opposite character, and frequent inclusion of red corpuscles in its substance. According to Rogers' experience in examinations of dysenteric stools, the harmless type is so rarely met with that, from the practical point of view, it may safely be neglected, and he agrees with Craig in thinking that whenever amebæ are found in diarrheal or dysenteric stools, they may be regarded as pathogenic, and their hosts treated accordingly.

As a rule, it is easy to find the amebæ with the microscope, owing to their numbers. Exceptionally, however, there are cases in which very few are present. Here, the following technique is of great assistance. By the addition of a drop of 1 per cent. watery methylene blue

solution to a piece of dysenteric mucus, the pus and epithelial cells are promptly stained, while the amebæ for a time resist taking up the stain and retain their activity. Consequently they stand out amid their blue surroundings as light, refractile, motile bodies, and are, therefore, easily detected. Rogers recommends that the examination be begun with a low-power lens, and the findings be confirmed by turning on the high power. A number of negative examinations should be made before giving up a search for amebæ. Naturally, full doses of ipecac or emetine should not be given before the stools are examined. Examination should be made within an hour or so of passage. The "organisms" should always be seen in active motion before a positive diagnosis is made, for there are often large mucoid cells present, especially in bacillary dysentery, which may easily be mistaken for inactive amebæ by the inexperienced.

Emetine treatment furnishes an accurate means of differentiating amebic from other forms of dysentery, or from carcinoma of the large intestine with dysenteric symptoms. Among 33 cases of dysentery treated by emetine, amebæ were found in 24, and, in all of these except 2 practically moribund cases, the dysenteric symptoms completely cleared up within two to four days. In none of the non-amebic cases did the drug have any material effect on the progress of the disease, although it never appeared to do harm. In other words, if dysentery is not cured by emetine injections, it is not amebic.

ADMINISTRATION. Two-thirds of a grain of the hydrochloride of emetine, subcutaneously, is given twice a day for the first two days in severe cases, and then once for another day or two. This is usually sufficient for a cure. Soft, solid food is begun on the fourth day. When the hypodermic method is objected to, two-thirds of a grain can generally be taken in tabloid form by mouth without producing any material sickness, and with much better results than with ipecac, although the action is slower and less effective than by the hypodermic method. In children aged about seven years, one-third grain doses of emetine are well borne and rapidly effective.

In hepatitis, half-grain doses of emetine hydrochloride hypodermically once or twice a day very rapidly relieve the acute pain and tenderness and stop the fever, while, if suppuration has not yet occurred, the leukocytosis also soon disappears, and the patient is convalescent. If the leukocytosis persists, there is probably a collection of pus in the liver.

Amebic liver abscess is no longer treated by open operation, but by aspiration and by injection of 1 grain of the soluble emetine hydrochloride dissolved in about an ounce of water, into the cavity before the cannula is withdrawn. The puncture is sealed with collodion. "Subcutaneous emetine injections should be continued for several days, to kill any amebæ remaining in the wall of the abscess or of

the large bowel, and if there is no secondary bacterial infection of the abscess, and it is still confined to the liver substance, it will nearly always dry up without further trouble, incision and drainage being usually unnecessary. If the cavity is a very large one, the aspiration may have to be repeated." In one case, 80 and 45 ounces of pus were removed by aspiration at an interval of ten days; the patient recovered perfectly under the emetine treatment. Rogers states that the disappearance of leukocytosis is evidence of the cure of an amebic liver abscess, and that, after aspiration, it is often difficult to decide whether the abscess is completely cured or whether pus has again accumulated, necessitating a further aspiration. The diagnostic value of leukocyte counts under such circumstances is very great. It frequently was observed that if an original, actual or relative leukocytosis had not disappeared within a fortnight after aspiration, pus was usually found again on exploration. On the other hand, when the original increase in the leukocytes vanished, the abscess was really cured, and further aspirations were negative. "There is good reason to hope that the open operation will in future be only exceptionally required in the treatment of amebic liver abscess.

Comparison of the ipecac and emetine treatments showed a mortality of 34 per cent. in the ipecac series against no deaths among the non-moribund cases treated by emetine.

Rogers concludes his article by telling of two most interesting cases in which amebic dysentery had been successfully treated three or four weeks previously. The patients were readmitted to the hospital in a moribund condition, apparently suffering from recurrence of their dysentery. At autopsy, the complete absence of amebæ throughout the tissues of the intestine and liver could be demonstrated. The terminal dysenteric affection was bacillary.

THE PANCREAS

The Diagnosis of Pancreatic Injury. Y. Noguchi¹ found that, in dogs, the normal amount of diastase in the blood and urine was increased within twenty-four hours after injury to the pancreas. It was believed that this increase was due either to the absorption of pancreatic juice from the peritoneal cavity, or to the absorption of autolyzed pancreatic tissue. There is a normal decrease in the amount of diastase shortly after meals. Unlike the dog, the human being normally has more diastase in the urine than in the blood.

The diagnostic value of this test is greatly lessened if the pancreatic injury is slight, or if chronic systemic affections, such as nephritis, diabetes, or pernicious anemia, are present.

¹ Langenbeck's Archiv, Band xxviii, Heft 2.

Noguchi and Wohlgemuth,¹ in a later communication, state that the test furnishes an accurate indication of the degree of injury present—the greater the trauma, the sooner the content of diastase increases, and the greater is its amount; therefore, if, after an abdominal injury, in a previously healthy person, the amount of diastase in the blood and urine exceeds the normal, one may be sure that the pancreas is injured, and may be guided accordingly.

THE SPLEEN

The Diet after Splenectomy should contain an abundance of iron. It has been found by Ascher and his pupils² that animals whose spleens have been removed secrete more iron than the normal controls. The same observation has been made by Bayer upon human beings whose spleens have been extirpated.

In healthy animals, it was found that an iron-free diet did not cause anemia, but that such a diet in splenectomized animals was promptly followed by a marked diminution in hemoglobin content and in the number of red blood corpuscles. This deficiency was promptly corrected by the administration of meat which contains plenty of available iron.

From these facts, it is apparent that splenectomy will not be followed by serious anemia if an abundance of iron-containing food is provided.

Aneurysm of the Splenic Artery. The following case reported by Villard and Murard³ is of diagnostic interest. A man, aged thirty-three years, had noticed an epigastric tumor since four weeks. Its appearance had been accompanied by a sharp attack of epigastric pain lasting twenty-four hours, with symptoms of peritoneal irritation. There was a history of momentary attacks of similar pain for two years previous to this. Upon examination, a solid tumor in the left hypochondrium was found. The diagnosis was made of a pancreatic cyst, hemorrhages into which had caused attacks of pain.

At operation, a large sac was found above the pancreas, reaching far to the left. It was not pedunculated. Upon opening it widely, it was found to contain blood clot. Aneurysm of the abdominal aorta was suspected, and the operation was terminated by tamponade of the opened cavity. All went well until the seventeenth day, when a fatal secondary hemorrhage took place. At autopsy, the opened sac proved to be an aneurysm of the splenic artery.

¹ Berlin. klin. Woch., 1912, No. 23.

² For references see footnote to editorial on Functions of the Spleen, Journal of the American Medical Association, October 26, 1912, p. 1546.

³ Arch. gén. de chir., 1912, vi, 7.

GYNECOLOGY

BY JOHN G. CLARK, M.D.

CANCER OF THE UTERUS

The Cancer Problem. Notwithstanding the enormous amount of work being constantly expended upon this question, there is no great or startling discovery to be noted during the past year, although there may be said to have been a certain amount of advance along many of the lines from which the problem is being attacked. From a practical standpoint, perhaps the most significant move that has been made in this country is that looking toward the energetic dissemination among the public of sane and authoritative information about cancer, a phase of activity which has been highly developed in some of the European countries, but which with us has been thus far largely neglected. At a meeting of the Clinical Congress of Surgeons of North America, held in New York last fall, a committee of five was appointed for the purpose of writing or having prepared popular articles on the subject of cancer, to be published in the daily press, and in the weekly and monthly magazines. The inception of this committee was due to the realization by several members of the Congress that the only way to wage an effectual campaign against cancer is to bring a knowledge of the subject before the lay public; the first thought was to limit the work of the committee to uterine carcinoma, but, at a subsequent meeting, its scope was enlarged to cover all forms of the disease. It was felt that such a campaign would be of far more value than some former ones, which have been directed to the practising physicians; these have, on the whole, proved of little value, because, as a rule, the physician sees the patient for the first time when the disease is already too far advanced. The chairman of the committee, Dr. Cullen,¹ reports that already some of the best-known magazines have asked for articles on cancer, and it is hoped during the course of the year to bring before the people in this way simply written articles on every variety of the disease about which they should be informed.

A somewhat similar campaign of education, though on a smaller scale, has been going on for some time in St. Louis and the surrounding country under the auspices of the Barnard Skin and Cancer Hospital.²

¹ Surgery, Gynecology, and Obstetrics, 1913, xvi, 102.

² Taussig, Transactions of American Gynecological Society, 1912, xxxvii, 372.

Members of the staff have adopted the practice of going, from time to time, to various county societies throughout the State, in the endeavor to interest their members in cancer of the uterus and other organs; talks have also been given before the Graduate Nurses' Association and the Visiting Nurses' Association, and a small pamphlet upon uterine cancer has been placed at the disposal of members of these associations for gratuitous distribution among their patients. In addition to these attempts to reach the medical profession and the nurses, efforts have also been made to bring the subject before the laity by means of a number of popular lectures which have been given by St. Louis physicians. It is hoped by this combined attack to force upon the general practitioners, the trained nurses, and the women themselves a realization of the great importance of seeking competent attention upon the occurrence of the first suspicious symptom.

Non-operative Treatment of Cancer. **CHEMOTHERAPY.** Since the publication by Wassermann,¹ something over a year ago, of his remarkable experiments carried out in connection with Professor Ehrlich in the treatment of mouse tumors by the intravenous injection of certain chemical substances, considerable interest has centred in this question of chemotherapy, both from the purely experimental standpoint and from that of its application to clinical medicine. The few scattering reports that have appeared relative to the actual employment of chemotherapy in clinical work show, however, that this too is still in a decidedly experimental stage, and no results have as yet been attained with human cancer in any way comparable to those secured in the laboratories with tumors of mice and other animals. That such practical results will never come from this work is, however, by no means certain, and it seems today to offer perhaps a more hopeful outlook for an eventual conquest of malignant disease than any other of the various methods by which the problem is being attacked.

The most interesting report concerning purely experimental work along this line that has appeared since Wassermann's is that of Caspari, Neuberg, and Löhe.² Their investigations are based on the experimentally demonstrated fact that neoplastic tissue is constantly undergoing more rapid autolysis than is normal tissue, due, they believe, to an attempt on the part of the invaded organism to destroy the tumor cells by the process of liquefaction. It seemed to them logical, therefore, to attempt still further to increase this process by bringing into contact with tumor tissue substances which have the power of stimulating autolysis; such are certain chemical combinations, especially colloidal forms of the heavy metals: silver, tin, cobalt, copper, platinum, etc. They too have carried out the majority of their experiments on mouse tumors, since these are the most easily

¹ PROGRESSIVE MEDICINE, June, 1912, p. 170.

² Deutsch. med. Woch., 1912, xxxviii, 375; Berlin. klin. Woch., 1912, xlix, 1405.

obtainable reliable material. They state that, after much experimentation, they have succeeded in getting the metals into such form that, in suitable doses, they may be injected into the general circulation, and will attack the tumor without killing the animal.

The amount of metal required to produce results is astonishingly small, varying somewhat according to the particular metal and the combination employed, ranging on an average (in comparison to the weight of the mouse) from 1 to 200,000 in the case of platinum, to 1 to 15,000 in the case of cobalt. The minuteness of these doses in proportion to the weight of the animal, in comparison with the much larger quantities of the Wassermann-Ehrlich eosin-selenium combination necessary to produce results, is of interest in connection with the possible application of some of these substances to the human body, one of the serious theoretic objections which its discoverers have admitted to stand in the way of such use of eosin and selenium being the colossal doses which would have to be given.

The action of these metallic combinations is extremely rapid, becoming evident within a minute or two after their injection. The first effect produced is hyperemia, which is followed by hemorrhage into the normally pale, poorly vascularized tumor tissue; this then undergoes softening, liquefaction, and necrosis, so that by the second day the tumor is transformed into a flabby, thin-walled sac, on whose inner surface little nodules can be felt. If the treatment is discontinued in this stage, the tumor invariably recurs, but, if the injections are continued, the nodules gradually disappear, and the sac wall becomes more and more attenuated, finally forming nothing more than a thin, transparent membrane. The scanty remains of tumor tissue still present at this stage are either completely necrotic, or have undergone fatty degeneration, so that the animal may now be considered cured. In no instance has recurrence taken place in an animal in which this stage had been reached, and, in microscopic preparations made from such animals, no intact tumor cells are to be found. In some instances, the tension within the sac becomes so great that it ruptures through the skin and discharges the fluid contents; this is generally followed by infection and death of the animal. When this does not occur, the remains of the sac gradually shrink to a thin, hard cord, which may remain palpable for months, but which finally disappears completely. In microscopic preparations made during the course of treatment, granular precipitates are found in the tumor tissue; these vary somewhat in color and general appearance according to the metal used, but can be demonstrated by microchemical reactions to be derived from it.

The metals are injected in the form of definite chemical combinations, mostly crystalloid in nature, but the authors believe that in the tumor they automatically pass through the colloid form, as substances which do not possess this property have proved entirely inert.

Curative results have been secured not only with large numbers of transplanted mouse carcinomas, but also with rat sarcomas, and with a spontaneous adenocarcinoma in a dog. That the phenomena recorded were not merely the results of spontaneous retrogression on the part of the tumors was shown by control observations of a similar number of untreated animals, among which spontaneous cures occurred with extreme rarity. Moreover, the course of tumor disappearance under treatment is entirely different from that of a spontaneously retrogressing neoplasm.

Unfortunately, all the substances used are fairly powerful poisons, and the authors have found the same difficulty in their use that Wassermann did with his eosin-selenium combination, namely, that the margin between the efficient and the lethal dose is very narrow. Too small a dose causes increased rapidity of growth of the tumor, instead of its destruction, evidently due to the irritation produced. On the other hand, if the tumor is made to disappear too rapidly, even under dosage not lethal *per se*, the animal may die from the toxic effects of overabsorption of the autolyzed tumor products. For these and other reasons, the authors emphasize strongly that their work is still in the purely experimental stage; it must, nevertheless, be considered an extremely important contribution in the field of cancer therapy.

LOEB'S WORK WITH COLLOIDAL COPPER. Loeb¹ and several co-workers at the Barnard Skin and Cancer Hospital have been using injections of colloidal copper in a similar manner, and state that while they have found it to inhibit the development of transplanted mouse tumors, at least at first, they have been able to produce retrogression and complete disappearance of the growth in only two instances out of a large series of experiments, the remaining animals showing, after cessation of the treatment, as rapid growth of the tumor as those not treated at all.

These investigators have not been satisfied to limit themselves solely to animal experimentation, however, but have also tried their preparation on a number of patients, all of whom were suffering from hopeless and inoperable carcinoma of some sort. Their solution of colloidal copper is prepared according to the method of Bredig; it is injected intravenously, warmed to body temperature, in quantities of 300 to 400 c.c., an injection usually being given daily. This is generally accompanied by a chill, and is always followed by a rise of temperature to 100° to 102°, this always falling to normal again within six hours, however. About two to four hours after the injection, hyperemia is noticed in the tissue around the tumor, accompanied by increased tenderness of the growth itself, and an increased amount of discharge if the surface is ulcerated. With repeated injections, all these effects become diminished in intensity, and often disappear

¹ Interstate Medical Journal, 1912, xix, 1015; *ibid.* 1913, xx, 9 and 16.

altogether, indicating a loss of efficiency on the part of the treatment. About 20 patients in all have been given injections so far; in most of these a gradual retrogression of the tumor has been observed, together with a marked relief of pain, but no case has been cured, and those with rapidly growing tumors or pronounced cachexia have not been benefited at all. Loeb, too, wishes it distinctly understood that he considers his work, even upon human subjects, still in the early experimental stage; the only conclusion that he is as yet willing to draw from it is that human cancer appears to be more susceptible to the action of colloidal copper, introduced intravenously, than is mouse cancer.

CLINICAL USE OF SELENIUM PREPARATIONS. A few scattering reports are beginning to appear in the literature of attempts to cure various forms of human cancer with selenium, but as yet these are too few in number, and for the most part too indefinite, to be considered in any way conclusive. Kessler,¹ for instance, says that, in connection with von Oefele, he has been using selenium in the treatment of cancer for some time. He appears to be quite an ardent advocate of this treatment, but reports only one case, that of a woman, aged sixty years, upon whom a Halsted operation had been performed for mammary carcinoma. She enjoyed good health up until 1910, about fourteen years after the original operation, but then began to develop signs of liver involvement. Treatment was begun with 1 mg. of selenic acid (SeO_2) by mouth three times daily. This was followed by shrinkage of the liver and marked improvement in the general condition but the drug had to be stopped from time to time on account of a troublesome diarrhea which it produced. Later, a different preparation, sodium selenocyanide (NaSeCN), was tried in the same dosage. After a time some renal irritation was produced, evidenced by a slight general edema, and a small amount of albumin in the urine, so that treatment was again stopped, but was subsequently resumed with somewhat smaller doses. The patient has apparently recovered completely, and has not as yet shown any signs of recurrence.

Laurent and Bohec² state that they have given intramuscular and intravenous injections of colloidal selenium to a patient suffering with carcinoma of the stomach, with resulting diminution of pain and improvement in the general condition, and Daels³ makes an exceedingly brief statement to the effect that he has given injections of "electro-selenium" to 3 cases of inoperable uterine carcinoma, employing a dose of 5 c.c. every other day. "The patients were delighted with the result; a few hours after the injection the unbearable pains ceased, and sleep came spontaneously;" not a word is said, however, as to the ultimate result, nor are any further details of treatment given.

¹ New Yorker med. Monats., 1912, xxii, 193.

² Med. Press and Circ., 1912, xciv, 470.

³ Zentralbl. f. Gyn., 1912, xxxvi, 1417.

COMBINATION OF CHEMOTHERAPY AND RADIOTHERAPY. Morton,¹ in an extremely indefinite and unscientific article, expresses his belief that a combined treatment of cancer by the use of radium or the *x*-rays in conjunction with certain chemical substances, especially those belonging to the fluorescein group, offers greater possibilities of success than either of these methods alone, because of the ionizing action exerted by the penetrating rays on the chemical substances, whereby powerful destructive properties of these are liberated, resulting in a dissociation and destruction of the cancer tissue. He believes that, in practice, all patients upon whom an operation is to be performed for the removal of a malignant growth should be treated either with *x*-rays or with radium, both before and after operation, but that this radiation should be performed only after saturation of the patient's system with eosin, fluorescein, or some similar substance. He says that he has used in this way "a large number of the well-known dyes, and has effected many complete cures in various types of cancer, but success was, nevertheless, erratic."

Recently, however, he has been experimenting with a purely chemical treatment, without the aid of radiation, his method being to administer by mouth several of the aniline dyes, on the assumption that they have a selective affinity for the cancer cell, and several days later to follow this with a salt of a metal which he assumes will combine with the cancer cells. Although he states that in 5 cases of inoperable carcinoma treated by this method "the results were far beyond his expectations," all his statements are extremely vague, no information whatever being given as to the nature of the tumors, the effects actually produced, the substances used, nor their doses, although some of this information is promised in a later paper.

RADIUM IN CANCER THERAPY. Meidner,² one of the workers in the Berlin Institute for Cancer Research, discusses the present status of radium and allied substances in the treatment of malignant tumors. He believes that, with the exception of radium itself and mesothorium, none of the so-called radio-active substances, with which the market is flooded, are of sufficient strength to be of value in the treatment of anything but small skin tumors of comparatively slight malignancy. His experience agrees with that of most investigators, that relatively large quantities of highly active substances are necessary for the attainment of satisfactory results. From his observations at the Cancer Institute, he declares himself decidedly pessimistic as to the final results to be expected from this form of therapy in combating malignant disease; especially is this true in regard to uterine cancer. He says that he has used mesothorium in a very considerable number of these cases, without being able to see the slightest beneficial result,

¹ New York Medical Journal, 1912, xcv, 625.

² Therapie der Gegenwart, 1912, liii, 63.

other than that attributable to the good nursing and general care that the patients received while under observation, and believes that this is the explanation of many of the reported cases of marked subjective improvement under this or similar forms of treatment.

Somewhat more optimistic is Petit-Dutaillis,¹ who believes that radium is of distinct value in the treatment of carcinoma, especially of the cervix uteri, and who believes, moreover, that its greatest efficiency is obtained from the application of comparatively small quantities, since he has seen at times the use of large amounts followed by unpleasant general effects, which necessitated stopping the treatment. He says that he uses a tube containing only 1 cg. of radium, and has seen a large cauliflower growth of the cervix completely cured by the application of this after the use of the curette and cautery. A beginning recurrence, two months after the original operation, also disappeared under two days' treatment with the radium tube.

MESOTHORIUM. Owing to the almost prohibitive cost which still so greatly hampers the general use of radium in tumor therapy, numerous attempts have been made to find other substances which possess a more or less similar action, combined with less difficulty of acquisition. Thus, the experiments of Arendt with the raw Joachimsthal pitch-blend in the treatment of uterine carcinoma were spoken of last year; more recently, Czerny and Caan² have reported some of their results with two radio-active substances, *mesothorium* and *thorium-X*. Czerny, who, as is well known, is the head of the Institute for Experimental Cancer Research at Heidelberg, has had placed at his disposal by several German firms about 250 mg. of *mesothorium*, a substance obtained in Brazil, possessing a definite radio-activity of its own, but containing also about 25 per cent. of true radium. The chief difference in its action from that of pure radium appears to be that it contains a somewhat greater porportion of the soft α - and β -rays, and a correspondingly smaller proportion of the hard, penetrating γ rays, so that its action on *superficial* growths, susceptible to the non-penetrating rays, is greater than a corresponding quantity of radium, but it is less efficient in the treatment of deep-seated tumors, where the hard rays alone are of value. *Thorium-X* is a degeneration product of mesothorium; its emanations consist almost exclusively of the non-penetrating α - and β -rays, which are given off with great activity for a short time, but the substance soon becomes inert. Its special application is in solution, introduced intravenously or by intratumoral injection. Czerny says that since he has been working with these substances for only about six months, no final conclusions as to their efficiency can be given, but that the results thus far obtained are at least sufficiently encouraging to warrant further investigations.

¹ La Gynécologie, 1912, xvi, 130.

² Münch. med. Woch., 1912, lix, 737.

In all, 120 patients have been subjected to treatment, the majority of these suffering with some form of carcinoma, some with sarcoma, and a few with other conditions, such as angioma, lupus, etc. Among these 120 cases were 32 breast, and 3 uterine carcinomas. Of the breast cases, 19 showed distinct subjective and objective improvement following the treatment, whereas the others were apparently uninfluenced. The technique employed was to apply a capsule containing the mesothorium, protected by a lead filter 1 to 3 mm. in thickness, directly over the nodule, leaving it there for from twelve to twenty-four hours at a time. When proper care was taken, there was no injury to the skin, the result being manifested by a softening of the nodule, and, finally, after two or three months, by its complete disappearance. In 4 instances, a celluloid tube containing 20 mg. of mesothorium was placed in the wound after a secondary operation for recurrent mammary carcinoma, being left in place for from twelve to twenty-four hours, then removed, and not reapplied. In none of these cases has a recurrence yet appeared, but as the time since operation is only three to five months, it is too soon to assume that they are definitely cured.

Two of the three cases of uterine carcinoma are passed over with the brief notice that subjective as well as objective improvement was noted. The third was a woman, aged forty-eight years, with an inoperable recurrence in the right parametrium after radical operation. A portion of the mass was removed by a secondary operation, and a tube containing 20 mg. of mesothorium placed in the wound, being allowed to remain for seventy-two hours. Up to and for a short time after the second operation, the patient suffered very severe pain, from which large doses of morphine gave no relief, but in four or five weeks these began gradually to diminish; an examination made at this time showed that the tumor mass had dwindled to nothing but an insignificant infiltration. The author remarks, however, that this patient had been treated with *x*-rays as well as with mesothorium after the second operation.

In regard to the use of *thorium-X*, Czerny says that he is not as yet prepared to give any definite report, but that he believes it will be found a useful adjuvant to the local application of mesothorium. After direct injection into accessible tumors of 1 c.c. of salt solution containing a quantity of *thorium-X* equivalent to 0.00001 mg. of mesothorium, temporary reddening, swelling, and tenderness of the tumor were observed, following by shrinkage and induration. Practically the same phenomena were observed after intravenous administration of the solution, and, in addition, certain general reactions were manifested, such as nausea and loss of appetite, but in no instance was there evidence of permanent injury being produced.

Microscopically, the action produced in tumor tissue by thorium

preparations is entirely similar to that which has been ascribed to radium; round-cell infiltration occurs, followed by connective-tissue proliferation at the cost of the carcinoma cells, until finally the latter are completely destroyed, and nothing but fibrous induration remains. In some cases, hemorrhagic liquefaction was noted, and in ulcerated growths exposed to direct radiation, extensive necrosis.

The use of mesothorium in the treatment of certain inoperable cancers is also favorably commented upon by Pinkuss.¹ He puts a quantity of mesothorium, corresponding in radio-activity to 10 to 19 mg. of radium bromide, in a mica capsule, over which may be placed a plate of silver, 0.05 mm. thick, to filter out the softer rays. In his experience, mesothorium is of value in causing the disappearance of local recurrences after operations for carcinoma of the breast and uterus, and also in preventing the formation of such recurrences, but it is not of much value in cases in which metastases have taken place in distant organs. It may also be of value in the treatment of inoperable or recurring carcinoma of the vulva, vagina, or cervix, in which the carcinomatous ulcer is superficial, and has not extended into the deeper tissues. In such cases, even if complete cure is not brought about, superficial hardening of the tissues may occur in place of the ulceration, whereby the subjective condition of the patient will be vastly improved. The action of mesothorium in these cases consists in first causing necrosis of carcinomatous tissue, this being followed by connective-tissue growth, and scar formation.

X-RAY TREATMENT OF UTERINE CANCER. Bumm² reports an interesting case, in which an apparently very successful attempt was made to influence a carcinoma of the uterus by the application of *x*-rays from the vagina. The patient was aged forty-six years, and was suffering with a far-advanced, ulcerated, inoperable carcinoma of the cervix, with massive infiltration reaching out to the pelvic wall to the left and posteriorly, completely immobilizing the uterus. On account of the impossibility of operating with any hope of success, the patient was subjected to *x*-ray treatment, large doses being given at intervals of from one to two days for a period of two months. After a respite of two months, the treatments were again begun, and were kept up for two weeks more, by which time the patient had received a total of 1600 "*x*-units" (Kienbock). On reëxamining her, Bumm was now surprised to find, in place of the former large crater, only a small cavity, in which were no proliferating masses. The cervix was indurated, and the former diffuse infiltration on the left side had given place to a hard tumor, which could be easily defined from the pelvic wall; both this tumor and the cervix were freely movable. The patient's general condition was also much improved; hemorrhage had entirely ceased,

¹ Deutsch. med. Woch., 1912, xxxviii, 1777.

² Zentralbl. f. Gyn., 1912, xxxvi, 1569.

there was less discharge, and pain had almost disappeared. She was now operated upon; the adnexa and pelvic peritoneum were found much indurated, the former constituting a solid mass with the uterus. The large tumor mass on the left side gave some trouble, but was eventually removed, leaving a large hole reaching down to the levator muscle. Convalescence was uneventful.

From this case, Bumm concludes that the application of x -rays from the vagina permits the use of very large doses without danger of burning the mucosa, and that, under the influence of such treatment, a fibrosis of the pelvic tissue occurs which prevents further spread of the carcinoma, and may lead to a cleaning up of the carcinomatous crater, after discharge of the necrotic neoplastic tissue. As a result of the tissue-sclerosis produced in this case, the diffuse infiltration of the parametrium became sharply defined from the surrounding tissue, and the inoperable cancer was transformed into an operable one. Scattered throughout even the densest portions of the tissue, however, nests of carcinoma cells were found, so that no specific action of the rays on the cancer cells themselves could be demonstrated. The author suggests the possibility of attempting, by still stronger doses, to produce an even more intense sclerosis, and thus completely to suppress the carcinoma, or perhaps to secure a direct action on the carcinoma cells.

EXPERIMENTS WITH ASCITIC FLUID. Attempts to cause a retrogression and disappearance of inoperable, malignant tumors by the injection of ascitic fluid obtained from a carcinoma patient have already been made by Hodenpyl and Risley, as was described in these pages a year ago. Ill and Miningham¹ now report a series of similar experiments, made with fluid obtained from a patient upon whom they had operated for carcinoma of the breast, and who, two years later, developed a persistent ascites, for the relief of which repeated tapplings became necessary. The fluid obtained was always of an opalescent, milky appearance, strongly alkaline in reaction, and contained 0.6 per cent. of albumin, with a trace of sugar. It remained sterile for months when kept on ice.

Since the patient remained for a comparatively long time in a well-nourished condition, showing no signs of failing health or cachexia, the possibility suggested itself to the authors that she had had a carcinoma of the liver, but was gradually throwing off the disease, with consequent cicatrization of the liver tissue and obstruction to the portal circulation; such an occurrence could be explained only on the theory that antibodies were being produced, which might perhaps be capable of transference to others by injection of the fluid. For this purpose, it was drawn into sterile bottles under the most careful

¹ Journal of American Medical Association, 1912, lix, 497.

aseptic precautions, and placed immediately in the refrigerator, where it was kept until wanted. No preservative was used, and no reaction was seen after any of the 560 injections given by the authors personally. In one instance the fluid was introduced by the rectum, in all others by subcutaneous injection. It was used only on patients in whom a diagnosis of inoperable, malignant tumor could be made with certainty, as the authors feared the risk of producing a malignant growth in an individual previously free, although in no case was any such tendency on the part of the fluid manifested.

In all, 27 patients were treated, some of them receiving a very considerable number of injections. In no instance was a cure obtained, but, in nearly all, improvement in the subjective condition was marked, the results reported by Ill and Miningham corresponding entirely in this respect with those of the earlier investigators along this line. Eleven of the patients were suffering from carcinoma of the uterus, vagina, or vulva, and one from a round-cell sarcoma of the vagina. In practically all of these there was very marked relief of pain, this failing to occur only in one instance, and, where hemorrhage had been severe, it was much reduced. In addition to the improvement in the general condition of the patients, the course of the disease appeared, in a few instances, to be somewhat checked, but, in the majority of cases, it was entirely unaffected.

With the death of the patient from whom the fluid had been obtained, the treatments naturally came to an end. At autopsy, she was found to have carcinoma of the liver and of both ovaries, and general carcinomatosis of the peritoneal cavity.

Pathology of Uterine Carcinoma. SCHOTTLAENDER'S MONOGRAPH. By far the most important contribution to the subject of the pathology of uterine cancer which has appeared during the past year is the colossal monograph of Schottlaender and Kermauner.¹ These authors have studied, in a remarkably thorough manner, 135 cases of carcinoma of the uterus, 2 cases in which the diagnosis rested between carcinoma and lymphangio-endothelioma, and 5 cases of vaginal carcinoma with uterine involvement. Begun by Professor Schottlaender in conjunction with his chief, von Rosthorn, while the latter was still head of the Gynecological Clinic at Heidelberg, continued by these authors after their transference to Vienna, then interrupted by von Rosthorn's sudden death, the work is now published by Schottlaender in conjunction with von Rosthorn's former assistant, Kermauner. It cannot but seem fitting that this great pathological study, after all its vicissitudes, should finally be issued from the II Gynecological Clinic at Vienna, now presided over by Wertheim, whose name is associated perhaps more intimately than that of any other man with the modern

¹ Zur Kenntnis des Uteruskarzinoms, Berlin, 1912.

clinical study of uterine cancer, and should thus form, as it were, a worthy complement to the exhaustive study of the subject from the clinical side, issued from the same clinic about two years ago by Wertheim himself.

Covering as it does over 750 large octavo pages, this monograph is too extensive to permit of but a few of the most salient features being considered in a comparatively brief review. For anyone, however, who wishes an insight into the laborious minutiae into which German scholarship can go in the study of a complex subject, for one who wants to study in detail any individual phase of the origin, development, or mode of spread of uterine cancer, or for anyone who desires a comprehensive presentation of the most important literature dealing with all aspects of the subject, this work can but be a rich mine of material.

Method of Study. The method of procedure adopted by the authors in this study has been to make, in almost every instance, a sagittal section from the entire hardened, unopened uterus, to embed this in paraffin, and section it in one block for microscopic study, this being done by means of an especially constructed, large microtome. In addition to these complete sagittal sections, transverse, frontal, and various other preparations were made as indicated in each individual case. Of the 135 cases of undoubted primary uterine carcinoma studied, 15 are classified as arising in the corpus, the remaining 120 in the "collum," this term being used, as is common in the German literature, to include the cervix *plus* the portio vaginalis. The authors state, however, that in a few instances in which the entire uterus had become transformed into a carcinomatous mass, it was almost impossible to determine whether the point of origin had been the corpus or the collum. Each case has been studied and described *in extenso*, an anatomical and histological description, with sketch, short clinical history, and summary being given.

Extension to Adjacent Structures. It was found that, in about 75 per cent. of all cases, the carcinoma had spread beyond the uterus into the parametrium, involving either the paracervical tissue proper, or the tissue behind or in front of the cervix. In many instances, it was found that a correct judgment as to the presence or absence of parametric involvement could be formed macroscopically; in others, however, this was impossible, since parametric infiltrates of an inflammatory nature cannot always be distinguished from carcinoma without the aid of the microscope. In over half the cases which appeared clinically to be cervical carcinomas, the parenchyma of the corpus was more or less involved as well. The authors were not able to discover, however, any constant factors which facilitate the spread of the disease to the corpus, such as age, consistency of the uterine walls, condition of the bloodvessels, etc. In almost half the cases of collum

carcinoma, the vagina was also involved in the malignant process, this affecting, in the majority of instances, the connective tissue as well as the surface epithelium. In practically all of these cases (with the exception of the five classed as primary vaginal carcinoma) a lymphatic propagation of the disease—and thus its secondary character—could be demonstrated.

Origin and Growth. With regard to the point of origin of collum carcinomas, the authors believe that it is extremely difficult, if not impossible, to determine whether a given case has arisen from the epithelium of the cervix or of the portio vaginalis. Of one thing they are certain—that almost every collum carcinoma arises in the immediate neighborhood of the external os, and generally on the site of an old laceration. Of all their cases, in only 5 was there not a distinct history of previous labors, and, in 4 of these, lacerations were present, resulting from abortions or discission operations. A tumor thus started can continue its development for the most part superficially, forming a mass projecting into the uterine cavity or vagina—a condition to which the authors have applied the term “exophytic”—or can spread chiefly by burrowing deeply into the tissues of the uterine wall—the “endophytic” type. Although *pure* instances of either are comparatively rare, most cases show a predominance of one or the other form of growth. The endophytic was found to be much the commoner, occurring 84 times as compared with 7 instances of the exophytic; in 32, both were present in more or less nearly equal amounts. A so-called “central cervical carcinoma,” such as has been described by Ruge and Veit, occurring deep in the wall, without any connection with the surface or glandular epithelium, has never been seen by the authors, although in several of their cases there were good-sized nodules, situated deep in the muscular tissue, and attached to the surface only by a fine strand of epithelium. In many slides, therefore, these appeared as true, independent, “central” nodules, but a series of sections always demonstrated their connection with the surface epithelium.

Involvement of Lymph Nodes. For the study of this important question the entire material was unfortunately not available, as in some instances glands had not been removed, or had been lost. Excluding these, however, 73 cases were left in which glands were available for histological study. In some of these, complete serial sections were made; in others, incomplete series; in others, again, only single sections from the various glands, the result being that involvement of these was found in about 43 per cent. of all cases.

Coincidence of Carcinoma with Fibroid Tumors. With regard to the relative frequency of this combination in fundal and cervical carcinomas, the authors state that their corpus cases are too few in number to enable them to draw any positive conclusions, although, so far as their material goes, it would appear that myomas occur slightly more

frequently in conjunction with corpus than with collum carcinoma, the figures being about 25 and 18 per cent. respectively.

Classification. The methods of histological classification of uterine carcinomas receive a careful discussion and critique at the hands of Schottlaender and Kermauner. The old division into squamous-cell and cylindrical-cell tumors, simple and apparently satisfactory though it seems at first glance, has too many shortcomings to be accepted by them. Since both cylindrical-cell and squamous-cell growths can arise from the cylindrical-cell surface epithelium of the cervical canal or from the squamous-cell epithelium of the portio, nothing is said as to the histogenesis by such a classification. The same objection obtains with regard to the division into surface-epithelium carcinomas and glandular carcinomas, which has been advocated by some authors, since in the uterus precisely similar glandular cancer-formations can arise equally well from surface as from glandular epithelium. A further evidence of the inability of the division into cylindrical-cell and squamous-cell tumors to care for all cases which present themselves is furnished by the introduction, by certain authors, of the additional term "round-cell cancer," but when we consider that cancer-nests often contain elongated, connective-tissue-like and polymorphous elements, even with this addition this classification is not comprehensive enough. The authors do not believe that *any* genetic classification can satisfy even minimal demands, since it is frequently absolutely impossible, with the methods at present at our command, to ascertain from exactly what point a given tumor has arisen. They have, therefore, been forced to be content with a purely formal, morphological classification, and have adopted the following system, which appears to them to have fewer points of weakness than any heretofore advocated. They distinguish, *purely morphologically*, between (1) *solid*, and (2) *primarily glandular*, in part secondarily solid carcinomas. To these groups may be added, in exceptional cases, another, (3) a combination of primarily solid and primarily glandular tumor formation.

By "solid" carcinomas the authors mean those in which completely filled-out epithelial nests are found in the tissue. The chief points of origin which come into consideration here are the preëxisting squamous epithelium of the portio vaginalis, metaplastic cylindrical surface-epithelium of the cavum uteri, and, finally, glandular epithelium. The solid carcinomas are divided into ripe, mid-ripe, and unripe forms. Individual nests are classed as ripe when distinct prickle cells are present, as mid-ripe or unripe when these are lacking, whether cornification is present or not. The distinction between the last two forms is based on the principle that if many polygonal, well-defined cells are present, they are classed as mid-ripe; when, however, small, round, oval, or irregular cells constitute the nests, they are considered unripe.

When nests of different types are present, the tumor as a whole is classed according to the preponderance of one or the other. In this classification, the so-called "basal-cell" forms fall into the group of unripe, solid carcinomas, though the authors state that they have never seen a uterine tumor that corresponded exactly to the classical description of this type of carcinoma.

In their series of cases, Schottlaender and Kermauner have found 115 to be of the primarily solid, 25 of the primarily glandular variety; 1 case belonged in their third group, showing a combination of both forms of growth. Of the solid forms, about 10 per cent. were ripe, 42 per cent., mid-ripe, and 48 per cent. unripe. In all but 1 of the primarily glandular cases, a multi-layered epithelium was present, and, in a considerable number, solid nests had arisen *secondarily* from proliferation of the lining cells, completely filling up the original lumen. In the group of glandular carcinomas, the authors have placed one case to which they would apply the much-disputed designation "adenoma malignum." This term, they insist, should be strictly reserved for those cases which show *in all parts* a single-layered epithelium; they do not consider tumors of this type as forming a distinct group, but would class them as a subdivision of the glandular carcinomas, of which they probably represent a temporary state, as a rule developing the multi-layered epithelium characteristic of true adenocarcinomas sooner or later. In the majority of instances, the corpus carcinomas were primarily glandular, the collum carcinomas primarily solid.

Early Diagnosis. The extremely important question as to the early histological diagnosis of uterine cancer is discussed at some length. The authors state that in this respect they are not able to agree with the majority of pathologists, most of whom demand definite evidence of *destructive* epithelial proliferation before they are willing to make a positive diagnosis of carcinoma. Schottlaender and Kermauner believe that it is possible to make this diagnosis without such evidence and even without the presence of distinct invasion of the deeper tissues on the part of the surface epithelium. The chief characteristics upon which they would base a diagnosis of early malignancy in the case of primarily solid growths (whether beginning as a superficial epithelial layer, or with the formation of solid cell-nests in the deeper tissue) are changes in the *cellular morphology*—alterations affecting the number, size, form, staining qualities, and arrangement of the cells and of their nuclei. Excessive cell richness, the occurrence of round, cylindrical, and intermediate forms, and coarse granulation of the protoplasm, with an especial affinity of this for eosin, are among the commonest of these changes in the cells. More important still is an alteration in their general arrangement; a certain irregularity appears, there is a loss of the typical firmness of structure—what the authors term an optical "unrest," or a certain "anarchistic tendency," becomes manifest; the

sharp definition between the cells is somewhat diminished, and the axis of the cell rows becomes abnormal, assuming an oblique direction to the surface, or running in various directions, cell rows crossing each other in crazy-quilt fashion. The dividing line between the epithelial and connective tissue also becomes less distinct, the differentiation between parenchyma and stroma more indefinite. Even more important than the foregoing are *nuclear changes*. The nuclei show variations in size and form, the chromatin network exhibits increased intensity of staining, and is coarser than normal; irregular clumping of the chromatin or a diffuse coloration appears. Giant nuclei may occur here and there. The authors do not lay any particular stress on the frequency of mitotic figures, however, or on the occurrence of atypical mitoses. These characteristics are, in their opinion, sufficient in most instances to differentiate early forms of solid carcinoma from the well-known examples of benign epithelial proliferation, in which the surface epithelium may be increased in thickness, and show metaplastic changes, as a result of which distinctly multi-layered squamous epithelium is not infrequently found lining the uterine cavity well above the internal os. Such conditions are generally the result of chronic irritation, and are not to be considered malignant, since in them the histological picture is that of normal, regular, squamous epithelium. It cannot be denied, however, that occasional cases will crop up in which even the most experienced observer will be unable to state definitely whether or not the boundary line of malignancy has been crossed.

In the early diagnosis of glandular carcinomas, practically the same characteristics are to be considered. Mere multiplication of layers on the part of the epithelium lining the glands is not to be considered a criterion of malignancy; to this must be added morphological irregularities of the cells, similar to those described above.

Bladder Involvement. An interesting point, brought out by Schottlaender and Kermauner, is that attached to the anterior cervical wall of uteri removed by the radical operation there may frequently be found a bit of bladder tissue—not, of course, in most instances, the entire thickness of the wall with the mucosa, but merely a few strands of smooth muscle, which can be distinguished histologically from that of the uterus. When no mucosa is present, the diagnosis presents some difficulty, but can be made with certainty when there are found lying upon the antecervical tissue, about 3 or 4 cm. above the internal os, considerable quantities of smooth muscle fibers, arranged in groups of varying sizes, and separated from each other by a small amount of connective tissue. These fibers are relatively large in comparison with those of the antecervical muscle tissue, and are arranged in a very compact and regular fashion. A further point of difference between the bladder musculature and that of the antecervical tissue is a peculiar

net-like arrangement of the former, which, in doubtful cases, may serve to establish the diagnosis. Excluding all cases in which bladder wall was known to have been intentionally resected, or was grossly involved with the cervix in a general carcinomatous process, 37 specimens were found in which bladder musculature—as judged by the above standards—was present. In 4 of these, histological examination showed the presence of carcinoma nests between the muscle bundles, and in several others the carcinoma showed such distinct evidences of beginning invasion that the bladder may fairly be said to have been involved in the malignant process.

Ureters. In only 4 instances have the authors been able to examine the ureter; in 1 of these, carcinomatous involvement of the wall was demonstrable, and in another much more recent case, not included among those forming the basis for the general study, similar involvement was found. In addition to these 2, the authors have been able to find reported in the literature only 6 cases of carcinomatous involvement of the actual ureteral wall, which would seem to indicate that while this cannot be considered in any sense immune, the generally accepted opinion as to its rather high power of resistance to invasion is, on the whole, justified. As far as can be judged from this very small number of cases, the two ureters are involved with equal frequency; in some instances the invasion takes place by continuity from the adjacent parametrium, in others through the lymphatics.

Tubes and Ovaries. In only a very small number of cases was carcinoma of the ovary associated with that of the uterus or vagina. In one instance the authors consider the condition one of multiple tumor formation, *i. e.*, of two independent primary carcinomas, since the histological structure of the two growths was entirely different (distinct adenocarcinoma of the left ovary, with ripe, solid, squamous-cell carcinoma of the vagina and lower portion of the collum). In 3 other instances, however, they consider the ovarian involvement secondary to that of the uterus, and explain this by assuming a retrograde transportation through the lymphatics along the tube. In only 2 instances was secondary involvement of the tube itself present. In a third specimen, three distinct tumors were found: A glandular carcinoma of the uterus, a carcinoma in the right tube, and an adenoma malignum in the left; each of these appeared to be independent and primary in origin. In still another instance, an adenoma malignum was present in one tube, and a carcinoma in the body of the uterus. The authors believe that glandular carcinomas, of the type of the “adenoma malignum,” may arise in the tube more frequently than is generally suspected.

Etiology. Schottlaender and Kermauner explain the origin of uterine cancer on the assumption that there exist, here and there, areas of epithelium of abnormal constitution—what Robert Meyer calls “indifferent proliferation zones”—which have persisted from the

embryonic period. As a result of a primary biological change occurring in this abnormally constituted epithelium—due perhaps to some form of irritation, associated with a general constitutional tendency—the epithelial cells, *while still in situ*, undergo a transformation of unknown nature, and assume malignant characteristics. Then, and not until then, does invasion of the underlying tissue occur. A carcinoma thus started grows chiefly by multiplication of its own elements; the authors are convinced, however, in contradistinction to Ribbert,¹ that a malignant transformation of healthy surface epithelium adjacent to the growing tumor-focus may occur, though probably only to a limited degree.

Operative Treatment and Results in Cancer of the Uterus. The symposium on uterine cancer, which formed part of the program of the 1912 meeting of the American Gynecological Society, has brought out for the first time a fairly representative report of results and expression of opinion on this subject from American surgeons. It certainly cannot be denied that the end-results obtained by many of the best men in this country, as reported at this meeting, appear at first glance ridiculously inferior to those of most of the European clinics; whether this inferiority is really so great, when all sides of the question are considered, is open to considerable question. Before discussing this matter, we wish to present a condensed summary of the American reports, and of a few from foreign sources, including among the latter only the more important articles that have appeared since the fairly comprehensive discussion of the European work in this field which appeared in this department a year ago. (All the articles from American authors included in this review, as well as the discussions, are to be found in the *Transactions of the American Gynecological Society* for 1912, vol. xxxvii; several of the papers have also appeared in various journals, as noted in each instance.)

AMERICAN REPORTS. Peterson² says that during a period of ten years he has seen 218 cases of carcinoma of the uterus (including both cervix and fundus); of these he considered but 51 (23 per cent.) operable. The operations were all performed by the abdominal route, and in every instance the diagnosis was confirmed by microscopic examination of the tissue removed. There were 10 primary deaths, giving a mortality of about 20 per cent. In 40 of the cases, the growth was cervical in origin; these gave a mortality of 22 per cent.; in 11, it was fundal, the mortality here being only 9 per cent. Peterson has been able to keep track of all the 41 patients who survived operation, but only 8 of these were done five years or more ago. Of these 8, 3 died of recurrence and 5 are alive and well after five years (3 cervix, 2 fundus cases). In the entire group of 41 survivors of the operation, 11 devel-

¹ PROGRESSIVE MEDICINE, June, 1912, p. 156.

² Surgery, Gynecology, and Obstetrics, 1912, xv, 135.

oped a recurrence, generally in the vaginal cicatrix, probably as a result of implantation during the original operation. As all the recurrences that he has seen so far have appeared within the first two years after operation, Peterson has hopes that many of the other patients who have passed the two-year period will remain permanently free.

In 29 instances pelvic glands were removed, but carcinomatous involvement was found in only 5. One of the patients in whom this had occurred is alive and free from recurrence after three years, but the others all died within less than two. Peterson considers that the removal of glands should be left until the last stage of the operation, and should then be performed only if the strength and general condition of the patient warrants it. It is practically impossible, he thinks, to remove all the glands, such extensive dissection adding, as a rule, too much to the shock. Moreover, in probably not more than one-third of the cases suitable for radical operation are the glands involved.

Drainage is employed by Peterson as little as possible; when he is obliged to introduce gauze for the control of persistent oozing, he always shuts it off completely from the general peritoneal cavity, bringing it out through the vagina. An important point in the operation he considers to be the avoidance of embolism, something which is often overlooked. The best way to accomplish this is to use great care in the handling of retractors, as the large pelvic veins may be exposed to much unnecessary trauma from these instruments in the hands of assistants who do not observe where the ends press, or how much force is being applied. Another important point, especially in reducing the primary mortality of the operation, is the efficient control of venous hemorrhage. This occurs chiefly from three localities: The transverse vesical veins, which run across the ureter; the veins which lie close to the uterus and ureter; and the veins posterior to the uterus lying in close relation with the rectum. From the last source the hemorrhage is easily controlled; that from the vesical veins can be prevented by separating the bladder from the vagina and uterus in the median line *only*, never attempting to separate it at the sides until after the vesical veins have been secured by forceps on each side of the ureter. These may then be tied, cut, and the ureter dissected out of its bed without hemorrhage. Bleeding from the remaining veins may be controlled by pushing the ureter down into the pelvis and clamping always toward the uterus.

Taylor¹ has been doing the extensive operation for carcinoma of the uterus only since 1910; in that year he operated on 70 per cent. of all cases seen, and in 1911 on 68 per cent. He does not remember what his percentage of operability was before he adopted the radical

¹ Surgery, Gynecology, and Obstetrics, 1912, xv, 141.

procedure, but is sure that it was less than this. He reports having operated on 28 cases in all, with a primary mortality of 11 per cent., and has 7 patients alive, but in all less than two years have elapsed since operation. He thinks that one factor in the better results obtained in the German clinics than in this country is the campaign of education which has been carried on so vigorously there, and which has resulted in patients coming to the surgeon much sooner after the onset of symptoms than is the case with us. He believes that *any* form of hysterectomy done within six months of the first noticeable symptoms will give better results than the most radical operation at a later period, and urges, therefore, that every effort should be made to get the cases at the earliest possible moment.

Taussig¹ has collected the reports of 60 radical abdominal operations for cancer of the cervix, 23 from his own experience, the remainder from that of seven other surgeons west of the Mississippi. His 23 personal operations represent a total of 115 cases examined, giving an operability of but 20 per cent. The primary mortality in the total series of 60 cases was 30 per cent. (18 deaths). Of the 42 patients surviving the operation, 12 developed recurrences during the first year, and 3 others subsequently. Six of the 72 remaining women have been lost sight of, 2 died of intercurrent disease, and 19 are at present known to be free from recurrence. Of the total series, however, only 14 patients were operated on more than five years ago; of these, 5 are still alive and free from recurrence. Taussig likewise blames the poor showing of American operators to the lateness with which cases come to them.

Bovée² says that he has been employing a combination of the Werder and Ries methods of radical removal of carcinomatous uteri since 1898; for the past ten years he has been making a routine practice of ligating the trunk or anterior branch of the internal iliac arteries at the beginning of the operation. Up to three years ago he had done by this method 36 cases, with a primary mortality of 25 per cent. (9 deaths). Of the surviving women, 6 have died of recurrence, 3 of intercurrent disease (1 of these lived eleven years after operation), and 8 are known to be well and free from recurrence for periods varying from four and three-fourths up to fourteen years. From the results of this admittedly small experience, Bovée says that he considers these radical procedures to be entirely justifiable, since 22 per cent. of his patients have lived an average of ten years after operation. He admits that occasionally women live for years after a simple vaginal hysterectomy, with no signs of recurrence, and says that he himself has two such patients, both of whom were operated on over seven years ago, but he believes, nevertheless, that this procedure should be reserved for cases in which

¹ Surgery, Gynecology, and Obstetrics, 1912, xv, 147.

² American Journal of Obstetrics, 1912, lxvi, 380.

the patient's condition is such as to prohibit the employment of the radical abdominal operation. He thinks that the primary mortality may be reduced by the more extensive use of the cautery to prevent contamination during operation, and has found Downes' electrothermic angiotribe very valuable for this purpose. In his experience, the operation ought not to take over an hour, and therefore it is better, as a rule, not to attempt any extensive dissection of glands.

Neel¹ reports the results from Kelly's clinic at Johns Hopkins for the period 1900 to 1912. During this time there has scarcely been an appreciable rise in the operability, which for the past five years has averaged about 54 per cent., as compared with 51.7 per cent. reported some years ago by Cullen for the period 1893 to 1899. In twelve years the radical operation has been performed 136 times, with a primary mortality of 20.5 per cent. (during the past five years, however, this has been reduced to 12 per cent.). Of 70 patients operated upon five years or more ago, 61 have been traced; 14 of these are living and well, 1 has died of intercurrent disease, and all the others show signs of recurrence, giving a five-year cure in about 20 per cent. of the operated cases. The technique employed has been first to cauterize the growth very thoroughly, and then to apply a benzine-iodine solution, followed by tincture of iodine, in order to dehydrate and, as far as possible, to disinfect the field. The cervical canal is always dilated to ascertain if a pyometra is present, in which case the operation is postponed. In most cases the ureters are catheterized just before operation, as this is of great assistance in isolating them later on, and does not seem to increase the liability to ureterovaginal fistula or to secondary infection of the urinary system. When once the ureters have been completely isolated, the catheters are removed. No attempt is made to extirpate other than parametric glands. All denuded surfaces are closed over as carefully as possible, a small cigarette drain being introduced through the vaginal opening. After operation, the patients are placed in the Fowler position, which seems to contribute greatly to their comfort during convalescence.

Cullen, also of Johns Hopkins, reports having done over 50 Wertheim operations, 25 of these five years or more ago, with a total primary mortality of 28 per cent., which has been reduced in his later work to 18 per cent. Of the cases of more than five years' standing, 11 have subsequently died, and 6 are known to be living and well, giving a five-year cure in 24 per cent. of the operated cases (as a matter of fact, these 6 cases all considerably exceed the five-year period, ranging from six and one-half to thirteen years since operation). Cullen says that he attempted to gather the experience of some of the Southern surgeons with this operation, but that in response to 85 letters sent to surgeons

¹ Surgery, Gynecology, and Obstetrics, 1913, xvi, 293.

and gynecologists throughout the South he learned that very few had had any experience in this line whatever, and that those who had, had made practically no attempt to keep track of their cases, so that nothing of value was to be learned from the few operations that had been performed.

Brettauer says that he has done 20 Wertheim operations since 1902; 1 patient lived three years, but all the others died in less than that time, certainly a very poor showing, but perhaps explained by the fact that all were very advanced cases. He makes the rather remarkable statement that during a period of ten years, in a material comprising some 15,000 gynecological cases, he has encountered but 39 patients with carcinoma of the cervix.

Polak has been following the radical method of operation for the past ten years, but, as far as he can find out, he has not a single patient alive upon whom it was performed, in contrast to which he has 4 who were treated by the Byrne method, these varying from eight to nineteen years since operation, a result which appears all the more remarkable as all 4 were cases which he considered inoperable by any radical method.

Graves has done the Wertheim operation in 18 cases, with 2 primary deaths. Ten of the patients are known to be living and free from recurrence, but all less than three years since operation; the other 6 died from recurrence.

Simpson's statistics are reported by Chalfont. Thirty cases in all were admitted to his service; of these, 9 were subjected to the radical operation, with 3 primary deaths; 3 others died within five and one-half years, and the remaining 3 are living and well at the end of the third year. In 4 cases, the cervix was amputated, and the tissue cauterized; 1 of these patients is alive after seven, and another after six years.

From the gynecological service at the University of Pennsylvania, Clark reported a total of 36 radical abdominal operations for carcinoma of the cervix performed since 1900, with the following results:

Operative deaths (peritonitis)	3
Died from recurrence in 3 months	1
Died from recurrence in 6 months	3
Died from recurrence in 10 months	1
Died from recurrence in 12 months	2
Died from recurrence in 15 months	1
Died from recurrence in 18 months	3
Died from recurrence in 2 years	5
Unable to trace	6
Alive and no sign of recurrence after 1 year	1
Alive and no sign of recurrence after 1½ years	2
Alive and no sign of recurrence after 3 years	1
Alive and no sign of recurrence after 4 years	1
Alive and no sign of recurrence after 4½ years	2
Alive and no sign of recurrence after 6 years	4

POSTOPERATIVE SEQUELÆ

Suppuration of abdominal incision	5
Cystitis	1
Peritonitis (recovery)	2
Ureteral fistulæ	2
Vesical fistulæ	5
Phlebitis	1
Laceration of rectum (fistula)	1
Pleurisy	1
Rectovaginal fistula	1

From this table it will be seen that a five-year cure was obtained in only 4 patients, or a little over 11 per cent. of the operated cases. Of course, it is possible that there may be some cures among those that could not be traced, but we have no right to assume this, and must throw them out of account altogether, or reckon them among the recurrences.

EUROPEAN REPORTS. Turning now to the foreign literature, we find that the majority of the Germans are still steeped in radicalism, their attention being fixed apparently almost solely on the attainment of the highest possible "absolute cure"—meaning the proportion of cases alive after five years to the *total number applying for treatment*, irrespective of how many were actually operated upon—but without paying too much regard to the price at which such results are sometimes obtained.

The record of the Jena Clinic during Krönig's incumbency is reported by Busse,¹ who says that although the time covered is comparatively short—from April, 1903, to September, 1904—the cases are of considerable interest, as they were all operated upon more than five years ago, the complete series being therefore available for determining the final results. During this space of somewhat less than eighteen months, 79 cases of carcinoma of the cervix presented themselves at the clinic; 3 of the patients refused operation, in 4 the process was too advanced for any attempt at radical removal, and in 12 more the operation was started, but had to be abandoned on account of extensive involvement. The rest were all operated upon, 59 by the abdominal route and 1 by the vaginal, giving an operability of 79 per cent. The primary mortality was 25 per cent., this high figure being due to the fact that the radical operation was attempted in many very advanced cases; 80 per cent. of the deaths were due to infection. All the patients who survived operation were traced, and 19 of them found to be still living and well, giving a permanent cure in 32 per cent. of the operated cases, and in 25 per cent. of all applying for treatment (absolute cure).

¹ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 35.

In the author's opinion, the value of the very radical operation is shown by the fact that, of the 19 women still surviving, no less than 12 had carcinomatous infiltration of the parametrium; in none of the survivors were carcinomatous glands found, however. In 2 cases, secondary operations were done because of recurrence, and both these women are still living. A ureter was resected in 12 cases, and a portion of the bladder in 4. In discussing this latter point, Krönig¹ says that he does not agree with Wertheim's advice against resecting ureters, for he cannot believe that a really radical operation has been performed when a ureter, which has had to be laboriously dissected out of carcinomatous tissue, is left *in situ*, even though its walls may be very resistant to invasion. He points to his high percentage of absolute cures in substantiation of this idea, and says that now that he has learned from the tabulation of his Jena cases by Busse what good results the radical operation is capable of yielding, he thinks he will attempt to push his operability up to at least 90 per cent., and will not hesitate, if necessary, to do a bilateral ureteral resection, with extirpation of the bladder and implantation of the ureters into the rectum.

Franz's Standpoint. "How can the final results of the operation for carcinoma of the uterus be improved?" asks Franz.² This would seem an easy question to answer; by bringing to operation as many *very early* cases as possible, the percentage of operability should be increased, the mortality lowered, and the lasting results improved. But every experienced operator knows what has been accomplished in this respect—nothing. In spite of Winter's³ efforts with both physicians and the public, Franz says that during his fifteen years of clinical activity in Halle, Jena, Kiel, and Berlin, he has seen absolutely no improvement in the condition of the cases applying for treatment. He thinks that the insignificance of the early symptoms in most instances is responsible for this, rather than indolence on the part of the women, or ignorance of practising physicians.

Franz takes the standpoint that all cases of carcinoma of the cervix must, if possible, be operated upon by the abdominal route, as only in this way can the parametric tissue be extirpated out to the pelvic wall, and the regional glands be removed. Nevertheless, in a few cases, the radical vaginal operation is indicated; such are women over sixty-five years of age, who usually stand the abdominal operation badly, and women with a very fat abdominal wall, making the technique of laparotomy exceedingly difficult. By the radical vaginal operation, he means that practised by Schauta (deep paravaginal incision, extensive preparation of the ureters, and wide resection of the parametrium);

¹ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 55.

² Arch f. Gyn., 1912, xcvii, 380.

³ PROGRESSIVE MEDICINE, June, 1912, p. 171.

the old, simple, vaginal hysterectomy he utterly condemns as amateurish. The radical abdominal operation, on the other hand, he considers capable of giving a greater proportion of lasting cures than any other known operation for cancer in any part of the body. This is shown by the statistics from his clinic at Jena (where he succeeded Krönig), which have recently been compiled by Busse. His work there covered the period from October, 1904, to March, 1907; during this time, 120 patients were admitted, and 87 subjected to the radical abdominal operation (all, of course, more than five years ago). There were 20 primary deaths, giving an operative mortality of 23 per cent.; the 67 survivors were all traced, and 33 found to be alive and free from recurrence, giving a five-year cure in 38 per cent. of the operated cases, and an absolute cure of 27.5 per cent.

Franz says that this is a higher percentage of absolute cures than has been reached by any other operator (Krönig, 25 per cent.; Zweifel, 20.5 per cent.; Wertheim, 18.6 per cent.). These results he has attained by steadfastly following two principles—very high operability, and extreme radicalism in technique. His operability averages 80 per cent. of all cases examined; this has remained practically unchanged for some years, and depends not so much upon the quality of the cases coming to his clinic, as upon the fact that he operates on every one that offers even the slightest chance. He says that he has operated on many patients who have been refused by other surgeons, and believes that he is not only more radical than others in his willingness to operate, but that he is also more radical in his technique, removing a much greater amount of parametric tissue, maintaining that in this respect he really begins where Wertheim leaves off.

In determining the operability of a case, he takes the standpoint that only when the carcinoma has grown through the bladder wall should operation be declined; infiltration of the parametrium, solid fixation of the tumor, extension of the growth to vagina and rectum—all these are no contraindications to this intrepid surgeon. Whenever there is the slightest degree of uncertainty as to the operability of a case, the patient should be given the benefit of the doubt, and the abdomen at least opened, for often cases turn out to be operable that on first examination appeared too far advanced. He considers that he has gone about as far as he can in the extension of operability, and does not believe that it will ever be possible to raise this much higher.

Notwithstanding his extreme radicalism, however, Franz says that he resects ureters in fewer and fewer cases each year, having done this but once in his last 72 operations, whereas formerly he did it quite frequently. Resection of a ureter complicates the operation considerably, and he believes that it is so seldom actually invaded by the carcinoma that he is willing to take the risk of leaving it in nearly all cases; whether this point of view is justifiable, only time will tell.

About half his mortality was the result of peritonitis, and he does not see any way to reduce this factor by an appreciable amount, as it is due in part to the bacteria present in the cancerous tissue, and in part to the very poor resistance of these patients, as a result of which many of them succumb to an infection that an ordinary individual would overcome. The other chief causes of death, such as shock and hemorrhage, will be gradually reduced, he thinks, with improving technique.

When a recurrence takes place, Franz thinks that it should be removed at the earliest possible moment; all patients should therefore be examined at frequent intervals after operation, in order that no recurrence may exist undiscovered for any length of time. Too great hopes should not, of course, be placed on these recurrence operations, but they are occasionally followed by unexpected and lasting cures. One very remarkable case of this sort has occurred in his experience; a woman, aged sixty-six years, with carcinoma of the cervix, was operated upon by the vaginal route in 1905; since that time no fewer than 5 reoperations for recurrences have been performed, 2 of these being laparotomies, and including the resection of a carcinomatous piece of intestine and of a portion of one ureter, with reimplantation into the bladder. The last operation was in 1909; since then there has been no further recurrence, and the patient is apparently well.

Occurrence of Spontaneous Cure. About the only German author of prominence who persistently raises his voice against this almost unbounded radicalism which has swept over his colleagues with regard to uterine cancer is Theilhaber.¹ While in no way denying the seriousness of the condition, nor condemning attempts at thorough removal in suitable cases, he calls attention to the fact that at least 200 apparently authentic instances of spontaneous cure are on record, and says that he has observed 3 such himself during the past few years. In each of these he had performed a hysterectomy for advanced carcinoma, but had been unable completely to remove all the carcinomatous outposts in the deeper tissue. Contrary to his expectations, all the patients went on to a complete and apparently permanent recovery, a condition which he has been able to verify by recent examination (the first of these patients was operated upon in 1905, the last in 1908). He urges that a careful study of all cases of this character may throw some light on the principle by which such cures take place, and eventually indicate how we may assist the process.

In the same article, Theilhaber has a word to say with regard to his frequently expressed theory that carcinoma can develop only in poorly nourished tissue, in accordance with which he believes that passive congestion, or any other method of treatment which will increase

¹ Deutsch. med. Woch., 1912, xxxviii, 1240.

tissue vitality, is indicated after carcinoma operations, reporting two cases to illustrate this. One was that of a woman with advanced cancer of the breast; she was operated upon, but four weeks later developed marked edema of the arm, with a hard swelling in the axilla. After the application of Bier's hyperemia, these both disappeared, only to return several months after cessation of the treatment. It was therefore started again, and kept up for two months, with the result that both swelling and lump again vanished, the patient remaining entirely well one and three-fourth years after operation. The other patient was a woman, aged fifty-six years, with advanced, ulcerated carcinoma of the cervix, and extensive involvement of the parametrium. After merely curettage and cauterization, treatment with hot air, hot douches, hot sitz baths, etc., was begun, supplemented by the injection every other day of 0.05 gram of sodium cacodylate. By the end of five months the cervix was entirely cicatrized, all discharge had ceased, the patient was gaining steadily in weight, and felt well and strong. Unfortunately, no report is given with regard to her subsequent history.

Like so many enthusiasts, Theilhaber is inclined to ride some of his hobbies a bit too far, however, and one form of treatment which he advocates will certainly find but few adherents. This is based on the belief that free hemorrhage at the time of operation tends to favor a good circulation in the tissues subsequently; he advises, therefore, the performance of venesection and the withdrawal of 400 or 500 c.c. of blood after all incomplete carcinoma operations which have not been accompanied by profuse bleeding.

A French Estimate of the Radical Operation. Without going into lengthy statistics, or citing actual figures, Faure,¹ of Paris, gives his conclusions, arrived at as the result of very considerable experience with the modern operations for cancer of the cervix, extending over sixteen years, and comprising about 250 cases. He has one patient still alive after fourteen years, and a very considerable number from five to ten years, and is therefore extremely optimistic regarding the benefits of the radical operation in suitable cases, but he is not one of those who would push the percentage of operability up to its highest possible limit, believing that in the long run more harm than good is done by such a policy. He does not think that the elaborate statistics published by many surgeons are of very great value, owing to the enormous difference in the seriousness of individual cases of cancer, according to the degree of involvement. For practical purposes, he groups cases roughly into three classes, realizing, however, that no such sharp division exists clinically: (1) Early cases, in which the cul-de-sac is free, only one cervical lip involved, and the uterus freely

¹ Arch. mens. d'Obst. et de Gyn., 1912, i, 149.

movable; in these, the mortality should not be higher than in pan-hysterectomy for any other cause, say 5 per cent. These are the cases in which permanent cure should be the rule, and recurrence the decidedly rare exception. (2) Somewhat more advanced cases; both cervical lips involved, also the vaginal mucosa adjacent to the cervix; bases of the broad ligaments invaded, and the mobility of the uterus partly lost. In these, the operation is, of course, vastly more serious; the mortality, even in the best hands, will average about 20 per cent., and permanent cures not over 50 per cent. (3) More advanced cases still; vaginal fornices filled with the growth, broad ligaments infiltrated, uterus fixed. In these, Faure considers operation rarely advisable; they should be treated palliatively, since, if the patient recovers from the immediate effects of the operation, recurrence almost invariably takes place. The occasional occurrence of unexpected cures, even in cases of this category, has resulted, he thinks, in operations being performed on them more often than they should be. All in all, he believes that the average mortality for the general run of cervical carcinomas, in the hands of a man doing a fair amount of such work, not hesitating at somewhat complicated cases, but not allowing himself to be too often drawn into operating on hopeless ones, should be about 15 per cent.—not too high a price to pay in view of the admirable results attained.

While recognizing the value of the vaginal operation, especially in its extended form, as practised by Schauta, Faure considers the Wertheim abdominal operation the one of choice in most instances, and it is to this that he has directed most of his attention. He does not believe in making an extensive search for glands, contenting himself with removing merely the hypogastric nodes if these are distinctly enlarged. One point on which he lays great stress is the bilateral ligation of the internal iliac arteries as a preliminary step in every abdominal hysterectomy for cervical cancer. The sole disadvantage of this is the difficulty of its accomplishment in fat women with deep pelves, and in such patients he omits it if the carcinoma is not far advanced, but in all other cases he carries it out, and has found that much of the difficulty can be removed by approaching the artery by opening the layers of the broad ligament. After its ligation, hemorrhage, both arterial and venous, is reduced to a minimum; the patient is spared much loss of blood, and the field of operation is kept relatively clear.

Faure has not found the ureters to be often actually invaded by the tumor, even if completely surrounded by neoplastic tissue. He has never resected one, believing that cases in which this is necessary had better be let alone. Preliminary catheterization of the ureters he condemns as useless and harmful; it is necessary to see these structures, and not to force one's self to recognize them by the sensation

which a catheter in their interior gives to the finger. He does not believe in placing clamps across the vagina both above and below the point at which it is to be cut across, as this necessitates an enormous amount of pelvic trauma, but contents himself with putting one or two small forceps below the tumor. When ready to cut across the vagina, he makes a small opening in its anterior wall, and introduces through this a strip of gauze, which absorbs any septic secretions that might contaminate it. He then examines carefully the interior surface of the vagina through this opening, and is able to complete its section through tissue that he is sure is absolutely healthy. The upper end of the portion remaining is now open, but this is of no moment, as preliminary treatment with iodine and alcohol has rendered it sufficiently sterile. After the introduction of liberal drainage, the pelvic peritoneum is closed.

In advanced cases, Faure says that he has occasionally found a combined abdominovaginal method of attack of great service. Beginning from below, he sections the vagina in a circular manner about 2 cm. below the lower limits of the growth, closing the vaginal cuff thus formed with a purse-string suture, and then goes in from above. This liberates the uterus to a certain extent, permitting of its being drawn up more freely, and consequently facilitates dissection of the ureters.

As a result of considerable experience, Faure is a strong advocate of the use of radium in these cases—not before, or as a substitute for operation, but after it. He condemns the practice of applying radium in the hope of reducing an inoperable condition to one of operability, as owing to its hardening action on the paracervical tissue, subsequent operation is usually rendered more difficult. The time to apply this form of treatment is after radical operation, when it is of undoubted value in destroying any stray cancer elements that may remain in the parametrium.

Value of Simple Vaginal Hysterectomy. The views of one of the leading Russian surgeons, von Ott, as presented by his assistant, Markowsky,¹ are worthy of careful consideration, presenting, as they do, the *patient's* point of view in a way apparently not thought of by most of the German clinicians. As is well known, von Ott is an ardent advocate of the vaginal route in gynecological work; as might, therefore, be expected, he prefers this method for the extirpation of the carcinomatous uterus. But more than this; he is strongly in favor of the old, simple vaginal hysterectomy, as opposed to the “extended” vaginal operation of Schauta or the radical abdominal method of Wertheim, basing his justification for this standpoint on the far greater number of secondary lesions caused by both the latter operations, as well as their higher death rate. In other words, he believes that the slightly greater

¹ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 715.

proportion of five-year cures obtained by the radical methods is purchased at far too high a price in mortality and morbidity. Markowsky has carefully analyzed, in this respect, the reports of both Schauta and Wertheim,¹ and compared them with the results attained in von Ott's clinic at St. Petersburg. He shows that Wertheim either injured or resected a ureter in 10 per cent. of his cases, Schauta in 3.5 per cent., von Ott in 0 per cent. Bladder injuries are recorded in 10 per cent. of Wertheim's cases, in 5.6 per cent. of Schauta's, in 0 per cent. of von Ott's. Wertheim and Schauta each injured the rectum in about 1 per cent. of their cases, von Ott again in 0 per cent. Summing up, Wertheim reports injuries to one of the important neighboring organs in no less than 21 per cent. of his operations, and Schauta in something over 10 per cent., but all these injuries are absent from von Ott's record (Wertheim's statistics are based on 500 operations, Schauta's on 445, von Ott's on 277).

Taking up the question of primary mortality, Markowsky points out that Wertheim lost 19.4 per cent. of his patients as a direct result of the operation, Schauta, 8.9 per cent., von Ott, 1.8 per cent. Notwithstanding this great difference in mortality, the operability reported by these three men does not differ greatly, being 43, 49, and 42 per cent. respectively. With regard to permanent results, Wertheim claims to have obtained a five-year "absolute cure" in 18.4 per cent. of his cases, Schauta in 16.6 per cent., and von Ott in 12.3 per cent. While the latter is forced to admit, therefore, that the adherents of the very radical operations can show a slightly higher percentage of permanent cures, it seems to him that the increased risk to the patient of immediate death is out of all proportion to this increased chance of cure. Viewed from the standpoint of the individual patient, for every 1 chance of cure that a woman has who goes to von Ott for treatment, she has 1.1 chances if she goes to Schauta, and 1.6 chances if she goes to Wertheim. To offset this, however, for every 1 chance she has of *dying* from the operation with von Ott, she has 5.4 chances with Schauta, and 12 chances with Wertheim. Thus, the last-named surgeon, in order to increase the individual's chance of cure by 60 per cent., has increased her probability of death by 1200 per cent. Viewed in still another way, for every patient killed by the simple vaginal operation, 13.8 are cured, but for everyone killed by the radical abdominal and vaginal operations, only 1.7 and 3, respectively, are cured. It seems to von Ott, therefore, that, from the patient's standpoint, his principle is much more humane than either of the others. He states, however, that as a matter of fact, he often removes some parametric tissue on each side of the uterus in conjunction with his simple vaginal hysterectomy, but that he never does anything to compare with Schauta's

¹ For detailed reviews of these see PROGRESSIVE MEDICINE, June, 1912, and June, 1911, respectively.

systematic dissection of the ureters and radical extirpation of pelvic tissue.

In comparing the reports¹ of the work being done on uterine cancer at the various European clinics with that in this country, several striking differences in conditions at once become apparent. In the first place, it would seem that this affection must be vastly more common among Europeans than among Americans. Consider, for instance, that during an interval of ten years, no less than 910 women with carcinoma of the cervix applied for treatment at Schauta's clinic in Vienna, and that during the same period, Wertheim, working in the same city, and not in a university clinic, actually operated upon 500 such cases; Döderlein, working in the smaller city of Munich, saw 211 cases of cervical carcinoma in four years, Thorn, 265 of uterine cancer (cervix and fundus) in his private practice alone in ten years; Krönig and Franz, in the little town of Jena, with less than 30,000 inhabitants, observed almost 300 cases in less than four years, and similar statistics might be quoted from many other continental clinics.

Contrast these figures with those of some of the men who might certainly be supposed to see a fair proportion of the cases in this country. Peterson has seen in his entire experience 218 cases of uterine cancer, of these he has operated on but 51; Bovée had done but 36 such operations up to three years ago; at the gynecological clinic at Johns Hopkins, which draws from a large territory in the Southern and Middle States, 136 radical operations were performed in twelve years, and from the gynecological clinic of the University of Pennsylvania we were able to report but 36 during a similar period; Brettauer says that in ten years he has seen but 39 cases of cervical carcinoma in 15,000 gynecological patients. Such striking differences are hardly explainable entirely on the ground that the cases here are more scattered, that a much larger proportion of American women with uterine cancer suffer in silence without consulting a physician, or that the profession, as a whole, in this country is not recognizing these cases when they do apply for treatment, but it certainly seems true that carcinoma of the uterus does not occur here with anything like the frequency that it does in Europe. Whether the more congested condition of life in Germany, for instance, with its sixty-five million people crowded into an area about four-fifths that of the State of Texas, is in any way to be connected with this apparently higher cancer incidence can only be conjectured, but this seems at least worthy of consideration.

A second point of striking difference between the American and European reports is the care with which the cases are followed up. Wertheim's monograph furnishes an ideal example of this; of the 500 cases reported, covering a period of ten years, every single patient has been kept track of; if living, her condition was known, and a complete

¹ See also *PROGRESSIVE MEDICINE* for 1911 and 1912.

autopsy had been performed on every one of the 93 who had died; this is not an isolated instance, however, most of the German clinics showing nearly, if not quite, as complete records of their cases. This sort of thing is, of course, practically impossible in America, for without the exact police registration system in vogue in Germany and Austria, it is usually impossible with us to trace a patient after a second change of address. Again, the German university professors, doing practically all their work in one clinic, surrounded by a large staff of assistants, many of whom remain for years, are in a much better position to secure the accomplishment of this routine work than are the majority of our surgeons, working usually in a number of hospitals, and dependent upon the assistance of internes or short-term men. Granting all these differences in facilities, however, we must admit that our German colleagues have shown a systematic thoroughness in the study of uterine cancer which is as yet almost unthought of in this country.

These very reports of the Germans, however, enticing as they may appear in their thoroughness, and in the statistical excellence of their end-results, reveal a degree of primary mortality and of postoperative morbidity that can but act as a check on the enthusiasm which must otherwise arise from a contemplation of the results alone. In attempting to formulate a definite judgment as to whether the radical type of operation should be as universally adopted in America as it has been in Germany, we must realize that the social conditions in the two countries are by no means identical, and that this difference may have considerable bearing upon our ultimate decision. Because the continental surgeon, working in his large clinics, crowded with an ignorant peasant population that stoically accept whatever fate may be in store for them, can largely ignore the question of mortality in working out a principle, it by no means follows that his American colleague can do the same. Neither American surgeons nor laymen are so temperamentally constituted that they can disregard an excessively high primary mortality except in operations of the direst necessity, and the effect of any type of operation upon the lay mind must, with us, be taken into serious consideration, for, after all, the layman alone counts as the final test of surgery. The specialist, who, in order to secure 50 ultimate cures, must reckon with 25 deaths, and 25 patients leaving his clinic with repulsive postoperative sequelæ, to drag out a torturing existence and lingering death, may drive away many other patients who might have been saved, for no operation can possibly gain headway in this country which carries with it a shockingly high mortality and a large number of distressing and disabling sequelæ. Moreover, any operation, to acquire a permanent place in our surgical armamentarium, must be not so difficult of performance that its usefulness is confined to a few highly trained specialists, but must be available for the great body of surgeons working in all parts of the country.

Viewing the situation from this standpoint, we certainly cannot censure von Ott's contention, quoted above, that perhaps the moderate increase in ultimate cures resulting from the very radical type of operation is at times purchased at far too high a price, and that the simple vaginal hysterectomy, with its small primary mortality and lack of postoperative complications, is by no means deserving of all the opprobrium that has been heaped upon it. At any rate, whichever view each of us accepts individually, one thing we must recognize—that in treating cancer of the cervix there can be no middle-of-the-road policy. Either the operation must be extremely radical (not necessarily including extensive glandular dissection, however), with a very considerable primary mortality and many distressing sequelæ, but with a fair number of ultimate cures among the survivors, or it must be much simpler in technique, with a minimal primary mortality and few sequelæ, but a much smaller percentage of cures.

RÖNTGEN THERAPY IN GYNECOLOGY

X-ray in Uterine Myomas and Hemorrhage. Next to the cancer problem, undoubtedly the most important question in the gynecological world today—at least on the continent of Europe—is that of the x-ray treatment of uterine myomas and of so-called “idiopathic” or “metropathic” hemorrhage. But little talked of or practised in this country, and almost ignored in the American literature, Röntgen therapy as applied to these conditions has assumed a position of great importance in Germany and, to a somewhat less extent, in France. The German literature alone upon the subject is already extremely voluminous, and practically every gynecological clinic of importance in Germany has installed an x-ray apparatus, and is trying it out on a greater or smaller percentage of the myoma and metropathia cases, according to the degree of enthusiasm or reserve with which this form of treatment is viewed by the surgeon in charge.

The really important position which it has assumed in gynecology in Germany is illustrated by the warning contained in a recent address by Menge before one of the large gynecological societies of that country. He admonishes the members that “they had better perfect themselves in the technique of this new treatment, for if they do not do so of their own accord, they will be compelled by the demands of practising physicians and of the laity; if they resist, then the greater number of myoma patients will pass out of their hands into those of the skia-graphers, which would be a most unfortunate result, because of the difficulty in determining just which cases are suitable for x-ray treatment, and which should be subjected to operation, a diagnosis that can be made only by a trained gynecologist.”

Until this treatment shall have been tried out in America more extensively than has as yet been the case, any definite expression as to its merits or shortcomings would of necessity be premature, but the results as recorded by those who have had experience in its application to gynecological conditions are certainly such as to warrant a greater interest on the part of the profession in this country than has so far been manifested, and we have therefore considered it justifiable to present a somewhat detailed *resume* of a few of the more important reports upon the subject, both from its ardent advocates and from those who view the innovation with more or less skepticism.

ALBERS-SCHÖNEBERG'S TECHNIQUE. One of the first Röntgenologists to demonstrate definitely that *x*-rays exert a destructive action upon the ovaries, and to attempt the practical application of this fact to the treatment of various forms of uterine hemorrhage, was Albers-Schöneberg. In a couple of recent articles, this author¹ gives the general principles of his technique as applied to the treatment of myomas and other gynecological conditions, and sums up the results obtained. The most essential factor, in his experience, is a suitable tube; of course, to secure deep penetration of the rays, a tube of moderate hardness must be employed, but it must not be too hard. He has found that those of about 6 to 8 "Walter" give, as a rule, the best results; this is just about the grade suitable for making skiagraphs of the hip-joint or pelvis. A tube of this sort, water-cooled, and provided with a "Bauer" regulating apparatus, can be used for hours at a time, with only sufficient intermission to change the water occasionally, and will long maintain a definite degree of vacuum practically unchanged.

The ordinary method of applying the treatment is shown in Fig. 106. A compression cylinder of 13 to 20 cm. diameter is used, this being placed just above the patient's symphysis, and tilted in such a manner that the direction of the rays is obliquely downward into the true pelvis, the position of the tube being about that ordinarily used in making pictures of the bladder. The compression caused by the cylinder forces the intestines out of the way, and produces an anemia of the skin, thus lessening the tendency to irritation. The patient's head, neck, and chest are protected by an adjustable lead screen, and the remainder of the body by the lead support under the tube. Between the lower aperture of the compression cylinder and the skin are placed four thicknesses of goat leather; this is a very important protection against burns, and should never be omitted.

For use in this work, Albers-Schöneberg has had a special table constructed (Fig. 107) which combines all the properties of a general gynecological examining table with very practical *x*-ray attachments,

¹ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxvi, 47; Fortschr. auf d. Gebiet d. Röntgenstrahlen, 1912, xix, 324.

permitting the tube to be placed as above described, so that the rays act through the abdominal wall, or beneath the patient, so that they pass through the back (Fig. 108), or in an oblique position for the treat-

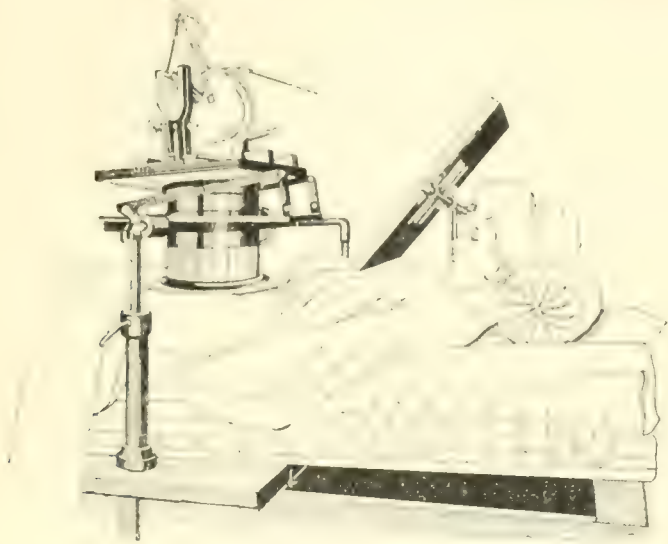


FIG. 106



FIG. 107

ment of the external genitalia (Fig. 109). The back-rest and leg-supports run on guides the whole length of the table, so that the patient can be put in any position at any point. With the coil placed upon a movable screen, provided with a window of lead-glass, the entire apparatus

takes up an area of only 4 square meters, and provides all the necessary facilities for *x*-ray work, gynecological examinations, and minor operations.

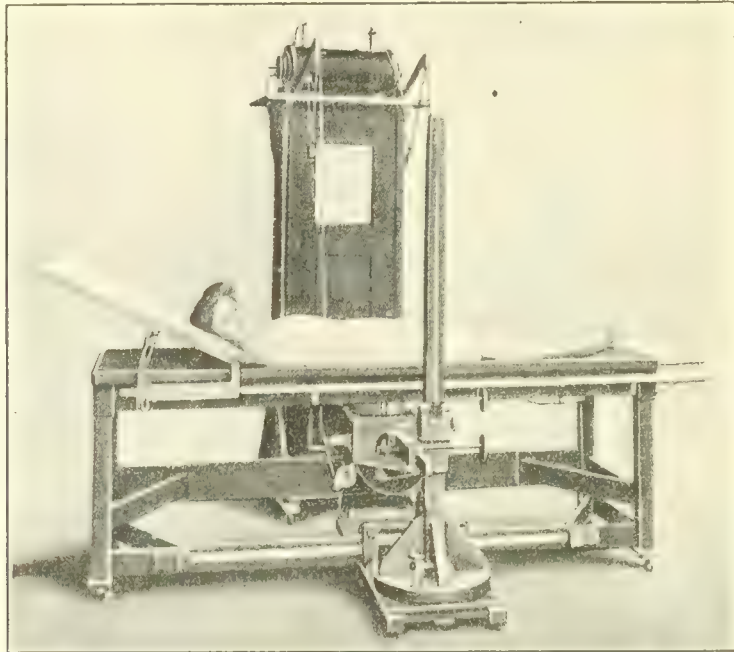


FIG. 108

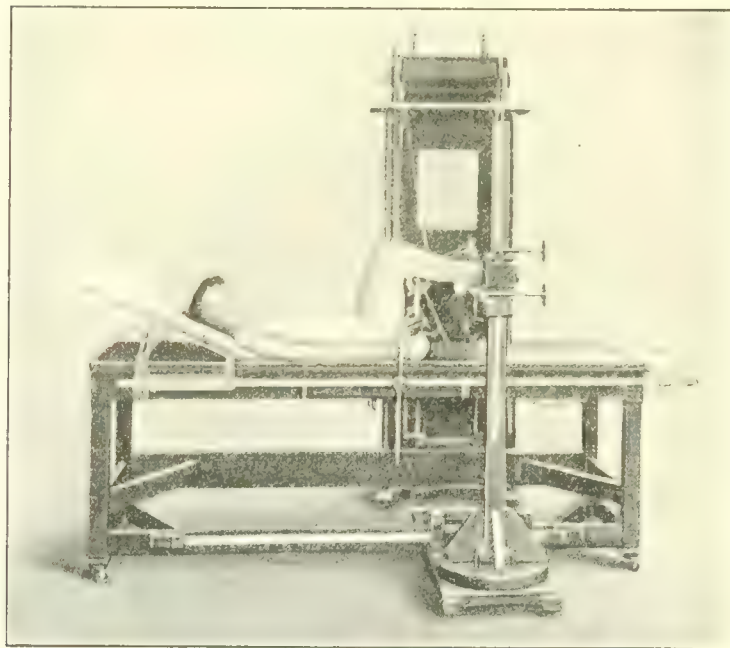


FIG. 109

With regard to *dosage*, the author believes that caution should be the watchword, and that each series of treatments should stop short of an erythema dose. He has found about $7\frac{1}{2}$ "*x*-units," as measured by the Kienbock quantimeter, the maximum that can be given with safety at each series of sittings. It is exceedingly difficult for one not expert in *x*-ray work to judge accurately of the intensity of the rays actually getting into the deeper tissues, but a good, practical method

of estimating this is to place beneath the pelvis a photographic plate, which is removed at the end of three minutes and developed. A good pelvic shadow, with fair degrees of contrast, indicates that the dosage has been sufficient; a clear plate, with no details, shows that not enough hard, penetrating rays are being applied, while a uniformly gray one is a sign of overdosage. Should the least symptoms of skin irritation—such as itching or burning—manifest themselves, further treatments must be at once suspended until they have entirely disappeared. If an erythema occurs, lead water or zinc ointment should be applied, and the patient warned to avoid all pressure from corsets.

The *general scheme of treatment* recommended by Albers-Schöneberg for use with the ordinary x -ray apparatus is as follows: Application of the rays for six minutes on each of three consecutive days; intermission of fourteen days; treatment for three days; intermission of fourteen days, and so on until the desired result is obtained. With the special apparatus described above, the author has been able to cut the total time required for a cure almost in half by proceeding as follows: Application of the rays *from above* for six minutes on three consecutive days; intermission of eight days; application *from below* for six minutes on three consecutive days; intermission of eight days, and so on, alternating the applications from above and below. Treatment should be suspended during the menstrual periods. An entire treatment may require anywhere from twenty-five to several hundred exposure minutes; as a rule, cases of myoma and of climacteric hemorrhage are to be treated until complete amenorrhea is established, but in other conditions, especially in women under forty years, the production of oligomenorrhea is often all that should be aimed at.

In the *treatment of pruritus vulvæ*, and other affections of the external genitalia, a much softer tube (5 "Walter") is employed, and is placed as shown in Fig. 109. No filters of any sort are used; a dosage of 6 to 8 x -units is sufficient.

With regard to the question of expense, the author states that if the instrumentarium is properly used and cared for, the cost of this form of therapy is by no means so great as is commonly believed. Of course, the chief item in the running expense is the cost of tubes. From careful records kept at his clinic in Hamburg, he finds this to average about 12 Pfg. (\$0.03) per exposure minute; for a complete myoma cure, requiring from 50 to 300 exposure minutes, the total cost at this rate would be 6 to 36 marks (\$1.50 to \$9.00). Even if we add to this interest on the cost of the apparatus, and a fair amount for depreciation, we see that the entire expense is no greater than that of various other forms of treatment which are employed daily in public hospitals, while a man doing this work in his office can charge private patients enough amply to repay him for his outlay and time, and yet the bill will not exceed that for the average abdominal operation.

Of 45 *myoma* cases subjected to *x*-ray treatment, the author is able to report a cure of all symptoms in 33, or 78 per cent., some of these dating back four years, others one to three and one-half years since cessation of treatment. None show any evidence of recurrence of symptoms, and in no case was an increase in the size of the tumor seen after starting treatment; a marked shrinkage took place, however, in 15 of the cases, complete disappearance of the tumor in 4, and almost complete disappearance in 2. Of the remainder, 4 were much improved, 5 showed no improvement, and 3 were operated on because of some complication. There was no case of burn in the entire series; the total dosage given varied from 17 to 390-*x*.

TECHNIQUE AND RESULTS AT THE FREIBURG CLINIC. By far the most insistent exponents today of Röntgen therapy in gynecology are Krönig and Gauss,¹ of Freiburg, their extremely radical standpoint of a year ago being maintained in more recent publications with undiminished vigor. In one paper² they go so far as to lay down the dictum that "surgical therapy has ceased to be the procedure of choice in the treatment of myomas and hemorrhagic metropathias, operative treatment being today reserved merely for a few exceptional cases, in which Röntgen therapy appears, for special reasons, to be contra-indicated." They answer indignantly the criticism that they do not practise what they preach—that a visitor to the Freiburg clinic may still see numerous myoma operations—with the retort that owing to the great expense of the new treatment, and the necessity for a large and trained staff to carry it out, it has not as yet been possible for them to apply it to all patients, notwithstanding that they have no less than four *x*-ray machines running ten hours every day.

Krönig and Gauss have not been content with the comparatively mild doses of the rays advocated by Albers-Schöneberg and most other workers in this field, but have introduced into their technique certain modifications, by means of which they claim to be able to give colossal doses without injury to the patient, thus greatly accelerating the cure, as well as raising the efficiency of the treatment. The most important of these modifications are: (1) The use of an *aluminum* filter, 3 mm. thick, between the tube and the skin, (2) placing the tube focus at a distance of only 20 cm. from the skin, and (3) the adoption of the principle of "cross-fire" action, *i. e.*, applying the tube to a different skin area each time, but always pointed so that the rays will converge at the same point in the interior of the pelvis. In a lengthy monograph³ recently published from the Freiburg clinic, the entire question is discussed *in extenso*, both from the theoretical and practical standpoint,

¹ PROGRESSIVE MEDICINE, June, 1912, p. 192.

² Deutsch. med. Woch., 1912, xxxviii, 940.

³ Gauss and Lembeke, "Röntgentiefentherapie," I Sonderband zu "Strahlentherapie," Berlin and Wien, 1912.

and a synopsis given of each of the 205 cases thus far subjected to x -ray treatment, these being divided into groups according to the particular technique employed.

By the application of the principles outlined above, the details of which are gone into very minutely, the authors claim to have been able to increase the total dosage from the original average of 10- x to an average, in the last 10 cases, of 1480- x , and correspondingly to reduce the total time required for treatment from many months to five weeks. The results recorded in the later series certainly appear very convincing, though in the earlier ones, treated with what now must appear primitive methods, they were very poor. Only seldom was any reduction in the amount of hemorrhage seen in the earlier cases; in but one instance was amenorrhea produced, and then it was not permanent. With the introduction of the improvements in technique suggested by Albers-Schöneberg, however, it was found possible to produce amenorrhea in about 50 per cent. of selected cases, this average being subsequently raised to 75 per cent., when the principle of cross-fire application of the rays was adopted, but only with the realization of the fact that by proper filtration enormously larger doses could be given than had formerly been thought possible, was the ideal result of 100 per cent. cures attained. That they do attain this almost unbelievable result is still tenaciously asserted by the authors, and this no longer in selected cases, but in *all* that apply for treatment (and can pay the price), with but comparatively few exceptions. They admit that they do not at present apply Röntgen therapy to cases of pedunculated myomas projecting from the cervix, of suspected gangrenous tumors, of tumors causing acute incarceration of the bladder, of myomas combined with carcinoma, or where sarcomatous degeneration is feared, although Krönig, in a brief word of introduction, expresses the opinion, based on theoretic considerations, that in the future it may be found possible to cure uterine sarcomas by the use of sufficiently large doses of the x -ray. The workers at the Freiburg clinic do not consider the presence of adnexal disease a contraindication to this form of treatment, as do many authors, since, in their experience, such cases appear to respond as readily as do those without this complication.

The occurrence in many cases of nervous symptoms due to impaired ovarian activity—expressively termed by the Germans “Ausfallserscheinungen”—is admitted by the authors, but these disturbances have never, they say, assumed the violent form so often seen after oöphorectomy, the reason for this probably being that while the ovarian follicles are destroyed by the x -rays, a portion of the internal secretory activity of the organ is maintained, at least for a time, so that the balance between the ductless glands is not so much disturbed.

The authors admit also that they have had some cases of skin irritation, but never a severe burn; with the improvement in technique,

however, these cases have steadily decreased, and have practically disappeared since the introduction of the aluminum filter. This appears to be, in Gauss' opinion, the most important single element in the technique; it must be exactly of the correct thickness—3 mm., as many of the soft, burning rays will pass through a thinner sheet. He believes that most of the cases of burning reported by various authors, either as occurring immediately, or appearing some time after treatment, are due to failure to appreciate the importance of this fact, with resulting use of too thin filters, or of those made of unsuitable substances. Other deleterious secondary effects—such, for instance, as injuries to the intestines, bladder, or other internal organs—have not been observed, nor do the authors have any fear of their occurrence later on.

In order to determine the lasting results of their work, Gauss and Lembcke have recently examined 55 patients, all of whom had been discharged as cured at least nine months previously, and have found that the condition present at that time—amenorrhea in the older patients, oligomenorrhea in the younger—had been maintained in all but one. In the latter, treated by the technique of Albers-Schöneberg, without the use of a filter, the symptoms had recurred. This gives a lasting cure (for 9 months) in 97 per cent. of the cases, but of 24 patients treated since the adoption of the filter technique, none showed signs of a recurrence. The time elapsed is, of course, rather short, but the authors believe that if recurrence were going to take place, it would probably do so within this time.

DÖDERLEIN'S RESULTS. One of the very few clinics to follow the lead of Krönig and Gauss in the use of massive doses of the x -ray is that of Döderlein, in Munich; having practised for a time the technique of Albers-Schöneberg, Döderlein and his associates have now adopted the Freiburg modifications, as a result of which they say that they are able to give as much as 300 to 400 x -units at a sitting with impunity. The results of the first year and a half's work with the x -ray in Döderlein's clinic are reported by Weber,¹ who seems to consider the most important gynecological application of this form of therapy to be in the treatment of climacteric hemorrhage unassociated with any demonstrable pathological condition. Forty-nine such patients have been treated during the time covered by his report; 9 of these have been lost sight of, but, in all the remaining save 1, an entirely satisfactory result was obtained. The single unsuccessful case was that of a woman, aged thirty-seven years, whose hemorrhages continued so profusely, even after several exposures to the rays, that hysterectomy became necessary. The author thinks that the comparative youth of the patient was the cause of failure in this instance. In all the others,

¹ Münch. med. Woch., 1912, lix, 745.

either complete amenorrhea was produced (in the older women) or the hemorrhages were reduced to irregularly recurring, insignificant bleedings, or to regularly recurring, normal menstruation. In every one of these patients, a previous curettement had been performed, so as to exclude malignancy. That the cure was not due to this, however, is shown by the fact that many of the women had been subjected previously to one or more such treatments, without any lasting benefit.

In the treatment of menorrhagias or metrorrhagias occurring *before* the menopause, the author has had less satisfactory results, and reports several complete failures, evidently due to the greater vitality of the ovaries at this time.

According to Weber, the α -ray treatment of myomas should assume a position distinctly secondary to that of the climacteric hemorrhages without tumor, owing to the greater difficulty in excluding non-suitable cases; it has nevertheless a distinct and important place in this field as well. He is able to report results in only 15 myoma cases, but is, on the whole, well satisfied with these, although here again there was one failure. This patient likewise was rather young—thirty-nine years—and the hemorrhages were apparently increased by the treatment, so that the uterus had to be removed. In all the others, not only was the hemorrhage controlled, but marked improvement in the subjective symptoms—pressure on the bladder, rectum, etc.—was brought about, and in several instances distinct shrinkage in the size of the tumor was demonstrable. The nervous phenomena of the induced menopause were in almost all cases absent or insignificant.

A similar shrinkage in size of a number of uteri, the seat of chronic metritis, after α -ray treatment is reported by Kelen,¹ who says that he has seen many of these enlarged uteri return almost to normal, in addition to which there has been, in a few instances, a corresponding involution and narrowing of the vagina, so that patients were spared the necessity of undergoing plastic operations, which had previously been advised.

RÖNTGEN THERAPY AT HEIDELBERG. Eymer² reports in considerable detail the results attained in Menge's Clinic at Heidelberg with the use of the α -ray in various gynecological affections. Since the introduction of this form of treatment in 1909, it has been applied to 164 patients, 94 of these being myoma cases, 46 "metropathias," 10 cases of hemorrhage due to adnexal inflammation, and the others miscellaneous conditions. Under the first group were included every variety of myomatous growth of the uterus, ranging from merely somewhat diffusely enlarged uteri, to large, multinodular growths reaching to the umbilicus. In most of these cases the bleeding was of the menorrhagic type, though in some it was metrorrhagic in character. In 49 of these

¹ Münch. med. Woch., 1912, lix, p. 749.

² Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 268.

patients, complete amenorrhea was produced, and, in 30, a distinct reduction in the size of the tumor was noted, this occurring in some instances before complete cessation of bleeding, suggesting the possibility of a direct action of the rays on the tumor. When a leucorrhœic discharge was present, this always disappeared. A marked improvement in the general condition of the patients was also noted, as well as a rise in the hemoglobin. In 11 of the myoma cases, merely an oligomenorrhea was produced, the treatment not being continued long enough to cause complete cessation of bleeding. The remainder of the patients have either been under treatment too short a time to judge of results, or have withdrawn for personal reasons of one sort or other.

In 25 of the 46 metropathia cases, amenorrhea was produced, and in most of the others the bleeding was so markedly reduced that the patients were satisfied, and withdrew from further treatment. Although numerous authors have warned against the employment of the x-ray in chronic inflammatory adnexal disease, on account of the supposed danger of lighting up a latent process, Eyster and Menge determined to try it in a few cases, and have been well pleased with the results. Three of the 10 patients were aged under twenty-five years, the others from thirty-five to forty years. In none was fever present at the time of beginning treatment. The chief symptoms in all were irregular, prolonged, and profuse menstruation, pain, and leucorrhœa. All these patients were reduced to a condition of oligo- or amenorrhea, this being accompanied by practically complete disappearance of pain and discharge in every instance. In a few cases of dysmenorrhea, kraurosis vulvæ, and peritoneal tuberculosis, little or no benefit was seen from the use of the rays, but one of pruritus vulvæ was much improved.

The work has been done chiefly with hard, water-cooled tubes, used in conjunction with a compression diaphragm of 20 cm. diameter, this being usually placed just above the symphysis, or somewhat higher in the case of large tumors; since 1910 the principle of attacking large growths from various surface points has been adopted. The rays are never allowed to act on any one area of skin for more than six minutes at a time on three consecutive days; no serious irritation has ever resulted from this dosage, but, in a few instances, a stubborn vesical tenesmus has followed each treatment, this always disappearing promptly, however, as soon as they were discontinued, and never being followed by any permanent trouble. In other patients, rectal tenesmus and diarrhea were produced, the latter being so severe in one instance as to threaten the necessity of abandoning further treatments. In one case, swelling of the breasts, with slight colostrum secretion, was noted, and, in several, shooting pains in the legs, probably due to irritation of the sacral plexus, were complained of. In at least two-

thirds of the cases, very marked nervous symptoms, such as are ordinarily associated with the loss of ovarian function, ensued; these usually disappeared after a comparatively short time, but in some of the younger women they persisted for over a year.

The total duration of each treatment has generally been from two to four, occasionally five months, a marked drawback, of course, but one which Eymer and Menge are making efforts to overcome, although they have not as yet persuaded themselves to give the massive doses recommended by Gauss and Döderlein. They realize fully that another great drawback to this treatment is the occasional occurrence of mistakes in diagnosis, which may lead to serious consequences, and report two suggestive cases in this connection. One was that of a woman who was treated with x-rays for a uterine myoma, with apparently great improvement—increase in the hemoglobin, and decrease in the size of the tumor; later on, renewed growth and an increasing anemia led to operation, at which an ovarian sarcoma was found, but no uterine tumor. In the other instance, an ovarian carcinoma was associated with a myoma; this patient also was x-rayed until increasing cachexia suggested operation. The author urges, therefore, the greatest possible care in diagnosis, and the adoption of the policy of operation in every doubtful case.

In view of these facts, Menge¹ says that he has attempted to establish, as definitely as possible, the indications and contra-indications for Röntgen therapy in the treatment of uterine myomas, this being, in his opinion, its most important gynecological application at present. He says that, in the Heidelberg clinic, the principle has been adopted of dividing all myoma cases into three classes:

I. Tumors which are causing very slight symptoms, or none at all, and which are not growing rapidly.

II. Tumors causing marked, but not unbearable discomfort, and which are not affecting the general health.

III. All rapidly growing tumors, and all which are causing constitutional symptoms, such as increasing anemia, or disturbances in the cardiovascular or urinary systems.

Cases falling in Group I are not treated at all as a general rule, although large tumors in women aged under forty years are sometimes removed, or operation is undertaken if myomectomy appears feasible.

All cases belonging to Group II should be treated in some way. This may assume one of three forms: (1) Symptomatic—rest in bed during the menstrual period, styptics, hydrotherapy, etc. Patients to whom this form of treatment is being applied must be under constant medical supervision. (2) Operative abdominal hysterectomy, with preservation of the ovaries. This is indicated in the case of

¹ *Monatsschr. f. Geburtsh. u. Gynäk.*, 1912, xxxv, p. 291.

young women with large tumors. (3) *X-ray*—applied to all older women (over forty years) without regard to the size of the tumor.

All cases in Group III should also be treated, but here only two alternatives come into consideration: (1) Operation—all women aged under forty years. (2) *X-ray*—all women aged over forty years, with the following exceptions, all of which demand operation: (*a*) Tumors causing pressure symptoms, or where these appear imminent; (*b*) markedly necrotic, softened, infected, or apparently malignant tumors; (*c*) submucous, polypoid tumors; (*d*) adenomyomas causing serious hemorrhage.

Whether acute inflammations of the adnexa are to be considered contra-indications to Röntgen therapy is yet to be determined, but chronic adnexal conditions may certainly be disregarded. Especially adapted to *x-ray* treatment are all myomas in elderly women with marked anemia, and those in both young and older women suffering with organic cardiac lesions, diabetes, nephritis, pulmonary or thyroid disease. Menge says that he has seen great benefit from the rays even in patients with a hemoglobin of 15 to 20 per cent. Often the first result in such cases is the production of increased hemorrhage, but this can be controlled by rest, styptics, vaginal packs, and energetic radiation. He believes that by adhering to the above outline, the greater number of myoma patients will be removed from the domain of operative surgery.

EXPERIENCE OF THE BERLIN CLINICS WITH THE *X-RAY*. Runge¹ gives the results obtained in the treatment of 84 myoma cases in the Charité (Franz). Eighteen of these patients were restored to practically normal menstrual life, in 13 there is still irregular, but very slight bleeding, and in 39, complete amenorrhea has been produced. In 4 cases the bleeding was increased in intensity, but these had only been treated once or twice at the time of writing, so that no conclusions can be drawn as to the final result, since not infrequently an increased amount of hemorrhage is seen after the first two or three treatments. In the remaining 10 patients, however, no effect was produced; in 1 of these the uterus was removed, and revealed the cause of non-success to be the presence of a mucous polyp, together with a submucous, necrotic myoma. The ovaries from this case showed complete atrophy, not a single follicle being found, even in serial sections. In 19 of the cases, a definite diminution in the size of the tumor could be demonstrated.

Owing to the very marked action exerted by the rays on the ovaries, Runge advises against applying this form of treatment to young women, on account of the danger of injuring, but not completely destroying, the ovarian parenchyma, as a result of which he fears that

¹ Med. Klinik., 1912, viii, 1107.

defective ova might be produced, which, becoming impregnated, would give rise to monstrosities or to imperfectly developed individuals.

The results of x -ray treatment in a series of private patients from Bumm's clinic are reported by Sippel.¹ The technique adopted was to divide the abdomen into twelve to eighteen areas, according to the size of the tumor, and to apply the diaphragm of the tube twice over each area in each series of treatments, extending over three or four days, two to four fields being exposed at each sitting for about three minutes each. A treatment series consisted usually of 16 exposures (eight fields) in cases of simple climacteric metrorrhagia, and of from 24 to 36 exposures in myoma cases. Vaginal exposures, through a tubular speculum of lead-glass, were also given in some instances. Between each series of treatments from eight to twenty days were allowed to elapse. The total dosage given in each series averaged fairly high, running from 140- x to 320- x , but notwithstanding this, no skin lesions were produced, the only untoward result encountered being the occurrence, in one instance, of a chronic diarrhea, indicating some intestinal irritation.

With one exception, all the patients were in the forties or fifties, and all appear to have received some benefit from the treatment, though some have been under observation for too short a time to permit of a definite statement. In all the myoma cases, 14 in number, a reduction of the tumor to from one-half to two-thirds its former size was observed, this shrinkage beginning usually after two or three weeks of treatment. Of a total of 23 cases, comprising, in addition to myomas, climacteric metrorrhagias and chronic metritis, complete amenorrhea was produced in 21, and in the other 2 the bleeding was reduced to within reasonable limits. The author explains the comparatively small number of patients forming the basis for the report on the ground that only those near the menopause, and in whom the remotest possibility of malignancy or of adnexal disease could be excluded, have been subjected to this form of treatment.

Haendly,² who is also connected with Bumm's clinic, says that the experience there has been that recurrence, after apparent cure of all symptoms by the x -ray, can occur at any time within a year after cessation of treatment, but that these recurrences are not often serious. He does not advise x -raying any patients with multinodular tumors, nor with tumors reaching to or above the umbilicus. He believes that the danger of overlooking tumors with malignant degeneration will be greatly reduced if the principle is followed of subjecting to operation all cases which do not show a prompt result after three or four series of treatments, although he has encountered one practical difficulty in carrying out this policy in the unwillingness of patients subsequently

¹ Berlin. klin. Woch., 1912, xlix, 1749.

² Zentralbl. f. Gyn., 1912, xxxvi, 1695.

to submit to operation if even a small amount of improvement follows the earlier treatments, no matter how strongly the surgeon may urge its necessity.

Mackenrodt¹ says that he is by no means as enthusiastic over the *x*-ray treatment of uterine myomas as are many of his colleagues, as he has had rather poor results from it, having been able to produce a satisfactory amelioration of symptoms in only about one-third of the cases upon which he has tried it. In attempting to establish definitely the indications for this form of treatment, he has gone over all his operative records for the past five years, during which time he operated on 418 patients suffering with uterine myomas; as he looks back over these, he says that he can find but 21 to which he would now consider that *x*-ray therapy might properly have been applied. In all the others, complications of one sort or other—such as very large tumors, association with carcinoma (6 per cent.) or with sarcoma (1.7 per cent.), ovarian tumors, inflammatory disease, degenerations, pregnancy, adenomyomas, incarceration, etc.—were present, which in his estimation, would have contra-indicated any but operative interference.

That this certainly must be considered an ultraconservative opinion, from the modern German standpoint, is brought out by a similar review of five years' myoma work by Strassman,² which probably corresponds much more closely to the average sentiment in that country today. He says that during this time he has operated on 295 such patients, but found in only 31 of these (11 per cent.) complications which would have contra-indicated radiotherapy; in all the others, he thinks it might have been tried with advantage.

Another author who expresses himself as rather unfavorably inclined toward *x*-ray treatment of myomas is Flatau,³ who claims that, even when successful in stopping hemorrhage, it does not affect the other symptoms or complications that may accompany or result from the tumor, the chief danger from this point of view being, of course, that of subjecting to Röntgen treatment growths which are undergoing malignant changes. As our knowledge of myomas is becoming more thorough, the old idea of the benignancy and harmlessness of these tumors is largely being given up; to say nothing of the 3 to 7 per cent. of cases reported as showing sarcomatous degeneration, however, such complications as necrosis, gangrene, adnexal tumors and inflammations, cervical and fundal carcinoma, etc., are present in a very considerable proportion of cases, and often constitute a pathological entity of equal or greater importance than the myoma *per se*. None of these conditions are relieved in the author's opinion by *x*-ray therapy, Krönig's totally unsupported statement with regard to its possibilities in the treatment of sarcoma to the contrary notwithstanding. More-

¹ Zentralbl. f. Gyn., 1912, xxxvi, 1692.

² Ibid., p. 1696.

³ Zeitschr. f. Geburtsh. u. Gynäk., 1912, lxx, 940.

over, little is known positively as to what may be the ultimate fate of myomas left in the body after Röntgen castration has been accomplished, and although the enthusiasts state that in no instance has degeneration or renewed growth occurred after cessation of treatment, the cases are still too few, and the time is too short, Flatau thinks, to form a definite judgment on this point.

An earnest warning against the use of such excessive doses of the x -ray as are advocated by Krönig and Gauss is given by Wetterer.¹ He thinks that the very rapid sterilization of women is followed by much more severe "Ausfallserscheinungen" than when the result is brought about more gradually, as the body has no chance to adapt itself to the new conditions, but he has a more serious objection still to offer against this kind of therapy, namely, the possibility of severe injury to other abdominal organs than the ones against which the treatment is directed. He has noticed this especially with regard to the intestinal tract, and reports having seen a number of patients who complained of nausea, vomiting, diarrhea, and abdominal cramps after each application of large doses of x -rays, in spite of every precaution being taken to shield the intestines. This effect was especially marked in 2 women who consulted him on account of abdominal pains, tenesmus, and the passage of mucus and blood from the bowel, all of which symptoms had come on in each instance after x -ray treatments for uterine hemorrhage. Both cases cleared up in a few days under rest, restricted diet, and opiates, but Wetterer feels sure that x -rays were responsible for the condition.

This assumption is strengthened by some experimental work on dogs reported by Regaud, Nogier, and Lacassagne.² They subjected a number of animals to doses corresponding, as nearly as they could judge, to those given to gynecological patients, and found that, in many instances, severe lesions of the gastro-intestinal tract were produced. These lesions were especially marked in the villi and glands of the small intestine, and consisted in a separation of the epithelium from the stroma, shrinkage of the connective tissue, and destruction of the cells. In some cases, a few days after the application of a large number of x -units, the glands of Lieberkühn had completely disappeared as a result of necrosis and absorption of the epithelial cells. These investigations appear to be of considerable importance, and show that in applying Röntgen therapy to abdominal organs other untoward effects than mere skin irritation are to be watched out for; especially is this to be borne in mind when the principle of cross-fire attack from several surface points is used, thus exposing the intestines to the danger of cumulative action, although completely avoiding any warning irritation of the skin.

¹ Deutsch. med. Woch., 1912, xxxviii, 2312.

² Archiv. d'électr. méd., 1912, No. 343, p. 321.

DIRECT ACTION OF X-RAYS UPON MYOMA TISSUE. The commonly accepted view in the medical world today with regard to the *modus operandi* of the *x*-ray in reducing uterine hemorrhage is that the effect produced is entirely the result of an action upon the ovaries, causing destruction of the parenchyma of those organs, with consequent elimination of their internal secretion. That this theory does not explain all cases, however, is maintained by Gräfenberg,¹ who believes that the rays may exert a direct influence upon the myoma cells themselves. In support of this opinion, he cites a case in which a large tumor, in a woman past the menopause, completely disappeared under *x*-ray treatment. The patient was aged sixty years, and had not menstruated for ten years; she had a large tumor reaching to the umbilicus, and a smaller one, the size of an apple, impacted in Douglas' pouch, pressing on the rectum, and causing obstinate constipation. By the end of two series of treatments, the upper edge of the large tumor had descended to a hand's breadth below the umbilicus; by the ninth week no mass at all could be felt on external examination, the abdomen being soft and non-sensitive, but a tumor the size of a mandarin orange could still be made out in Douglas' pouch. By the fourteenth week, however, this also had completely disappeared, and the only traces of tumor formation still demonstrable were two small nodules, the size of hazel-nuts, on the anterior surface of what could now be distinguished as a small, somewhat retroposed, rather irregular uterus. The patient had gained 11 pounds in weight during the treatment, and was entirely free from all pain, and from the severe gastro-intestinal disturbances which had been present.

The author thinks that in this instance, ten years after the menopause, sufficient ovarian function cannot have been still extant to explain the effect produced by the treatment, but that this must have been due to a destruction of the myoma cells themselves by the rays, and concludes that these cells probably possess a specific affinity for the rays, which exert, therefore, a greater destructive action upon them than upon normal tissue.

A certain amount of support to this theory is furnished by some histological studies by Robert Meyer,² who has made a careful microscopic study of 6 cases in which the uterus and ovaries were removed after ineffectual *x*-ray treatment. Although he could not find any absolutely distinctive changes in the myomas, he was struck by the high degree of fibrosis in all, this being especially noticeable in one case, in which the tumor formation consisted merely of a few small nodules no larger than peas. In some of these, practically nothing was left of the muscle parenchyma beyond a few, small, scattered cell bundles, the ground substance consisting almost entirely of fibrillæ,

¹ Berlin. klin. Woch., 1912, xlix, 328.

² Zentralbl. f. Gyn., 1912, xxxvi, 529.

and showing much sclerosis and hyaline degeneration. Throughout this stroma were many small bloodvessels, whose walls appeared so much better preserved than the surrounding tissue as almost to suggest an angiomatous condition; the adjacent myometrium was in marked contrast, however, being everywhere well preserved. Meyer admits that, of course, definite conclusions can hardly be drawn from the study of so few cases, especially in view of the frequency with which sclerotic and hyaline changes occur in myomas, but he says that he has never seen anything like such extensive changes of this character in such small tumors as were present in the case referred to, especially during the period of sexual activity, and he considers that these findings must be considered as at least lending weight to the theory of a selective action of the α -ray upon myoma tissue. In the ovaries from these cases nothing was found except characteristically degenerated ova and a reduced number of follicles.

RADIUM IN THE TREATMENT OF MYOMA. Very closely related in its action to the α -rays is radium, and it is but natural, therefore, that attempts should have been made to employ it in a like manner for the reduction of uterine hemorrhage accompanying fibroid tumors. This has been done on a fairly extensive scale by Chéron.¹ His method is to introduce directly into the uterine cavity, if possible, a tube containing 50 mg. of pure radium sulphate, wrapped in several thicknesses of gauze to cut off the softer rays. Where it is not possible to introduce the tube into the uterine cavity, he thinks that vaginal applications may suffice, but that under these circumstances larger quantities—100 to 150 mg.—should be employed. At the initial application the tube is allowed to remain in place for about seventy hours, but after that only from six to twelve hours at a time.

In considering results, he divides his cases into two groups: (1) Small tumors, not rising more than four finger-breadths above the symphysis, and (2) larger growths. Of the first group, he has treated 120 cases; in all but 3 of these definite hemostasis resulted. Of the unsuccessful cases, 1 was a woman, aged sixty-six years, with a calcified tumor; in the other 2, treatment was stopped too soon, for reasons not stated. In the second group, comprising the larger tumors, the results were by no means so satisfactory. Only 25 such patients came under treatment, and of these complete amenorrhea was produced in but 12, a reduction of the bleeding in 5, no change in 3, and an augmentation in 4.

Success or failure to produce amenorrhea with radium appears to have no relation to the intensity of the hemorrhages before instituting treatment, as often the worst cases yielded more quickly than those in which the condition was less serious. Diminution in the size of the

¹ Jour. de Méd. de Paris, 1912, xxxii, 494.

tumor, when it occurred, appeared after the menstrual alteration; it is due, the author believes, merely to vascular changes, resulting in a lessened congestion, and not to any indirect action through the ovaries. Contrary to most investigators, Chéron does not believe that the rays emitted by radium have any destructive action upon these latter organs, as he has seen, in several instances, the occurrence of pregnancy after prolonged radium treatment in cases of chronic adnexal inflammation. He has not seen any untoward effects result from his treatment, beyond the occasional occurrence in a few cases of an insignificant vaginitis, indicating apparently that the dosage had been somewhat too large.

MESOTHORIUM. This substance, so closely allied to radium in its physical properties, has been used by Friedländer¹ in an attempt to influence the ovaries directly. He places the mesothorium in a capsule, whose outer casing consists of sheet silver 0.05 mm. thick; this is wrapped in a thin layer of cotton moistened with a few drops of adrenalin, so as to secure an anemia of the mucosa, thus minimizing the surface irritation and favoring penetration of the rays. The capsule is then introduced into the vagina through a speculum, and placed as close as possible to the ovarian region. In the author's opinion, this method of treatment possesses great advantages over the α -ray, these consisting in the lack of complicated and expensive apparatus, and in the fact that the rays are applied from a point close to the ovaries, so that there is no danger of skin irritation. He has found that with this, as with other forms of radiotherapy, results are obtained much more quickly, and with greater certainty, in women near the menopause than in younger individuals. In the latter, it is often impossible with mesothorium to produce complete amenorrhea, but even a temporary reduction in ovarian function, as evidenced by the reduction of severe menorrhagia to within the limits of normal menstruation, usually accomplishes the desired result in the treatment of excessive bleeding due to uterine myomas.

MALIGNANT DEGENERATION OF UTERINE MYOMAS. In view of all this activity on the part of many European surgeons in endeavoring to establish a non-operative treatment for the majority of cases of uterine myoma, the question of the frequency of malignant degeneration in these has assumed a position of intense practical importance, and several recent investigators have shown a tendency to place it at a figure considerably higher than has generally been accepted in the past. Klein,² for instance, reports that up to December, 1911, he had examined 1156 women suffering with uterine myomas; of these, 491 came to operation. Among these 491 specimens, 38 were found which showed either a malignant degeneration of the tumor itself, or combina-

¹ Deutsch. med. Woch., 1912, xxxviii, 1450.

² Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 630.

tion with a malignant epithelial growth of the uterus, these conditions being distributed as follows: In 13 cases sarcoma myomatis, in 16 cases carcinoma corporis uteri, in 9 cases carcinoma cervicis uteri.

Although this gives the rather high ratio of 7.7 per cent. of the cases showing malignancy, Klein believes that it would have been still larger had it been possible to subject every one of the nodules to a complete microscopic examination.

An even higher percentage of cases showing sarcomatous degeneration is reported by Warnekros,¹ who says that owing to the ease with which small areas of beginning sarcoma may be overlooked in the ordinary, routine histological examination of fibroid tumors, it may fairly be assumed that the majority of reports as to the frequency of this complication give figures somewhat lower than would be the case were it possible to make complete serial sections of every such tumor removed. This supposition is strengthened by the fact that with the gradual introduction of more and more systematic examination of all uterine tumors on the part of many large clinics, the percentage of sarcomas reported has steadily risen, until now it may be judged from the available literature to average about 4 or 5 per cent. in the opinion of most pathologists. In the last 78 cases operated upon at Bumm's Clinic, however, no less than 7 were discovered which showed sarcomatous changes in some portion, giving a ratio of almost 10 per cent. Of course, this series is too small, as the author admits, to fix definitely the occurrence of sarcoma in myomas at any such figure as this, but he believes that this investigation should serve as a warning, since had Röntgen therapy, instead of operation, been applied to these patients, 7 of them would have fallen victims to an inoperable sarcoma, as in none of them did the symptoms or history give any hint that the condition was other than a simple myoma. Had they been subjected to *x*-ray treatment, there is no doubt that some improvement would have been noted at first, for so long as the hemorrhage is due merely to the myoma, radiation will produce an apparent cure. Sooner or later, however, the growing sarcoma would have produced renewed bleeding and aroused suspicion as to the true nature of the case, but not until valuable time had been lost, and the tumor in all probability reached an inoperable stage.

Warnekros goes so far as to advise pan-hysterectomy rather than supravaginal amputation for all myoma cases, as only thus, he thinks, can the danger of a sarcomatous recurrence be avoided. To illustrate this, he quotes the instance of a woman from whom a tumor, which presented, on microscopic examination, the picture of a myosarcoma, had been removed by supravaginal hysterectomy; after two and one-half years, she returned to the clinic with a large sarcomatous nodule developing from the cervical stump.

¹ Arch. f. Gyn., 1912, xxvii, 292.

However much one may agree with the author of this paper regarding the advisability of operation *versus* x-ray treatment for the majority of myoma cases, one cannot help feeling that his statement of finding sarcomatous degeneration in almost 10 per cent. of a fairly large number of specimens must be taken *cum grano salis*. Anyone who has examined microscopically any considerable number of these tumors must realize to what a large extent personal equation enters as a factor in diagnosing early malignant changes, a factor which has been left out of consideration entirely by Warnekros, although he does state that the diagnoses in the cases he reports were confirmed by no less a pathologist than Ruge, so that very considerable credence must be placed in their accuracy. No one can deny, however, that in many myomas areas are found in which the individual cells present irregularities in appearance, sufficient perhaps to elicit from some pathologists a diagnosis of beginning malignancy, although anyone with corresponding clinical experience must feel sure that the vast majority of these patients would never have developed the slightest signs of that condition. Some of the illustrations accompanying Warnekros' article suggest that the corresponding specimens may belong in this category, although it is, of course, unfair to form a judgment merely from a drawing of one small field. It certainly would seem, however, that if true malignancy develops in anything like the proportion of myomas that Warnekros claims, clinical sarcoma of the uterus should be a very frequent condition, instead of a decidedly uncommon one; especially must we be impressed with this discrepancy when we consider the enormous number of women who have myomas, but never come to operation at all.

THE UTERUS

Displacements and Malformations. PROLAPSE. The end-results secured in the treatment of 223 cases of extensive prolapse, with marked cystocele formation, in the gynecological clinic at Kiel are reported by Thiessen.¹ All were treated by the Schauta-Wertheim—or, as it is perhaps better known in this country, the “Watkins” operation—the principle of which is the interposition of the corpus uteri between the rectum and the bladder, so that it forms an additional support for the base of the latter organ. Of these 223 patients operated on during the past six years, about one-half were subsequently examined in the clinic, and all the rest were either examined by their family physicians, or sent replies to letters of inquiry concerning their condition. Recurrence of the prolapse was found to have taken place in 17 instances, giving a permanent cure in 92.4 per cent. of all the cases operated

¹ Inaugural Dissertation, Kiel, 1912; Zentralbl. f. Gyn., 1912, xxxvi, 1550

upon, a very good showing, considering that in all the condition was advanced. In the author's opinion, this result, based upon the examination of such a large number of cases, amply justifies the assertion that this type of operation, combined with an extensive repair of the perineal floor, is the best form of plastic procedure for the cure of large cystoceles.

A new and rather ingenious method of operation has been devised by Bumm¹ for the treatment of bad cases of prolapse in which an unsuccessful attempt at cure by extirpation of the uterus has already been made. When a recurrence takes place in these cases, the last state of the patient is worse than the first; there is no longer uterus, fascia, or any real pelvic floor present to withstand the abdominal pressure, and the organs which prolapse through the vulva are covered only by thin skin. Reoperation on these cases is very unsatisfactory, owing to the absence of any tissue suitable for the formation of a new pelvic floor. Posteriorly, it is possible to obtain support by bringing together the fibers of the levator muscle, but anteriorly it is almost impossible to secure any support which will keep up the bladder and vaginal vault.

In 4 cases of this sort, Bumm has secured what appears to be a very satisfactory result by utilizing a portion of the fascia lata. After having sutured the levator posteriorly, he dissects the bladder and urethra upward until he has freed the descending ramus of the pubis; he then excises a piece of fascia lata from the thigh, and places this like a transom between the pubic ramus, so that it holds back the bladder and remains of the vagina. On subsequently examining a patient upon whom this operation has been performed, the firm fascial plate could be distinctly felt through the anterior vaginal wall. Bumm thinks that this method is preferable to that of bringing together the stumps of the ligaments in front of the uterus, as it does not necessitate opening the peritoneal cavity. Even if the fascial transplant fails to heal, the worst that can happen is for it to undergo suppuration and be discharged; this is not likely to happen, however, if the fascia is well cleaned of fat, and if the area into which it is to be transplanted is made absolutely dry, but if any considerable amount of hemorrhage is present, prompt healing cannot be expected.

RETROVERSION. For the past three years, Willis² has been performing an operation for this condition which is based on the same general principles as that devised by Coffey, but is somewhat less complicated. The first step is to grasp each round ligament $1\frac{1}{2}$ to 2 inches from its uterine attachment (Fig. 110), and to bring it to a point in the midline of the anterior surface of the uterus, $\frac{1}{2}$ inch below the fundus; a linen thread is then passed through half the thickness of

¹ Zeitschr. f. Geburtsh. u. Gynäk., 1912, lxx, 921.

² Surgery, Gynecology, and Obstetrics, 1912, xiv, 618.

one round ligament, through a good bite of uterine tissue, and then through half the other ligament (Fig. 111). When this suture is tied, the round ligaments are brought together in the median line. A running suture is then carried downward, taking in the *broad*, instead

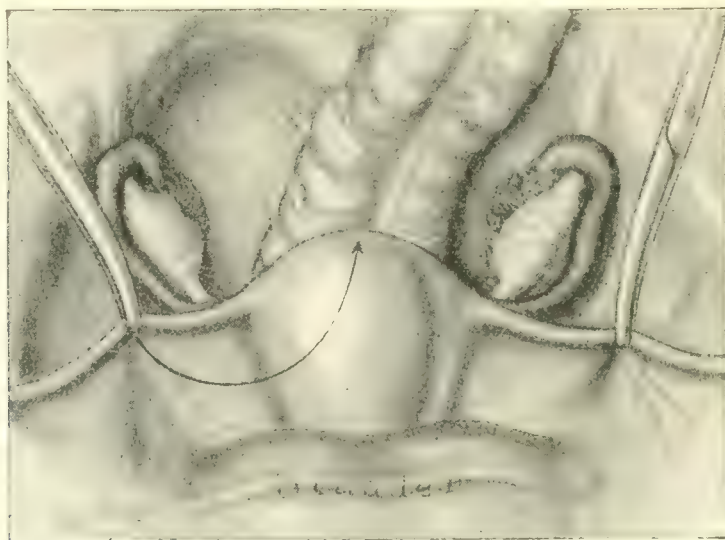


FIG. 110



FIG. 111

of the round ligaments, and including a bit of the uterus as well in the first three or four stitches, then leaving this, and plicating the broad ligament alone to within $\frac{1}{2}$ to $\frac{3}{4}$ inch of the bladder (Fig. 112). After drawing this suture taut, an extra interrupted stitch is placed

for reinforcement in such a way as to secure the round ligament to the uterus at a point half-way between its original insertion and its new attachment (Fig. 113).

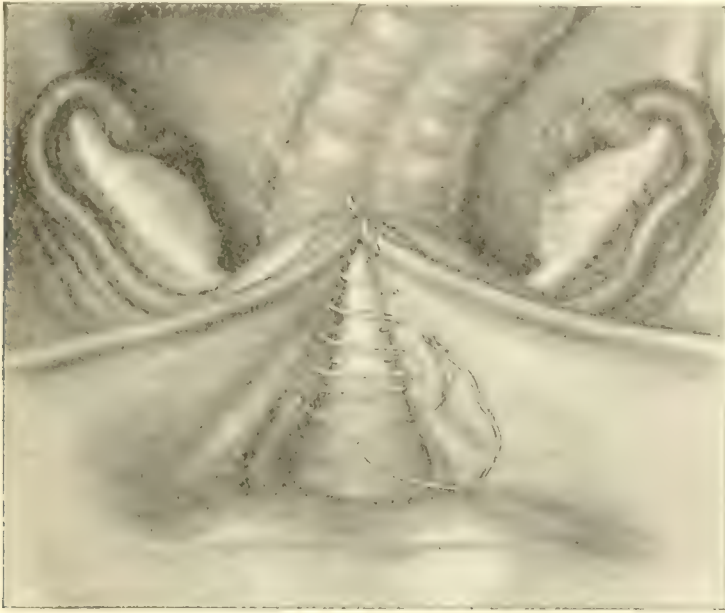


FIG. 112

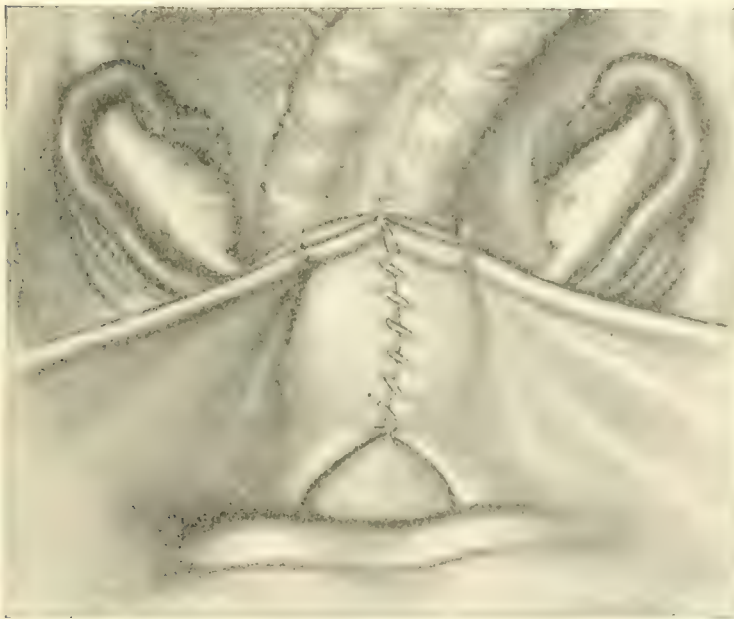


FIG. 113

Willis reports that he has done this operation on 60 patients, with excellent results so far as he can tell in the comparatively short time that has elapsed since he devised it. There has been but one recurrence of the retroversion, in a case in which catgut was used instead of linen. In 2 instances, pregnancy has taken place since the operation, but no trouble whatever resulted. The abdomen was reopened in

one case for some other condition two years after the retroversion operation; the uterus was found in good position, and the round ligaments still firmly attached. The author believes the operation to be designed along rational, anatomical lines; the sutures are placed at the point of least vascularity of the uterus, and the dangers of intestinal obstruction are obviated by the absence of any adventitious ligaments which might afford opportunity for the entanglement of a loop of bowel.

SURGICAL TREATMENT OF UTERINE MALFORMATIONS. In some instances of malformation of the uterus, operation may be indicated on account of frequent abortions, dystocia, tendency to placenta prævia, or other disturbances in the uterine function. An interesting series of such operations on double uteri is reported by Strassmann,¹ of Berlin. The first was performed on a patient, aged twenty-seven



FIG. 114.—Uterus bifidus drawn out through anterior colpotomy.

years, with uterus duplex, who suffered from dysmenorrhea and dyspareunia, and who had had eight abortions, all from the left horn, but no living child. The vagina was single, and the cervix merely divided by a septum, but the bodies of the two uteri were completely separate.

The uteri were drawn out through an anterior colpotomy, and both opened longitudinally on the median edge (Fig. 114). Then sufficient material was cut away from the wall of each uterus to produce a single organ of about normal size when the two halves were united. This was done by a double-tier suture of catgut (Fig. 115), the first row bringing together the deeper portions of the muscle tissue, the second the peritoneum, the result being a pear-shaped body corresponding in general size and shape to the normal uterus (Fig. 116). The cervical septum was cut through, and a small gauze drain placed in Douglas' pouch.

¹ Berlin. klin. Woch., 1912, xlix, 1750.

The patient recovered, and about eighteen months later gave birth to a living, full-term child; this has been followed by two more pregnancies, one of which also went to term. In the last pregnancy the author had the opportunity of examining the placenta, which was unusually large, and showed a distinct partial division into two lobes, corresponding to the juncture point of the two uteri.



FIG. 115.—Both uteri opened along median edge; sutures in place in posterior wall.



FIG. 116.—Uterus after junction of the two halves.

Strassmann reports a second case, in which he performed a similar operation on a woman who had had two abortions and one full-term pregnancy, all from the right horn of a uterus duplex. The technique and operative results were the same as in the first case, but in this instance no pregnancy has since occurred. In 2 other cases he has performed similar operations by the abdominal route upon nulliparous individuals, both of whom had a double uterus with closure of one horn, and consequent hematometra and dysmenorrhea. In both instances, the blood-clot was removed and the two uteri united, with resulting establishment of normal, painless menstruation, but in neither

has there been an opportunity to observe the course of a pregnancy (one of the patients was a girl, aged eighteen years, the other an unmarried woman, aged thirty-two years).

MENSTRUATION

Composition of Menstrual Fluid. Some new ideas as to the reasons for the non-coagulability of menstrual blood are advanced by Bell,¹ who has made careful chemical analyses of the fluid obtained from 10 cases of hematocolpos due to atresia. He found in these that blood, estimated from the amount of iron present, formed, on the average, somewhat less than 50 per cent. of the whole; mucin, probably arising from the cervix and vagina, was always present in large amount, and the calcium content was always very high, amounting, in some instances, to six times or more that of normal blood. He was unable to find urea, fibrin-ferment, or fibrinogen in any instance; it is upon the absence of the two latter substances that he believes the non-coagulability of the fluid to depend, in contradistinction to the older theory that it is due to the presence of mucin or lactic acid. He believes this lack of fibrinogen and fibrin-ferment in the menstrual fluid to be due to some vital activity on the part of the endometrium, which must destroy or extract these substances, since there is nothing in the secretions of the vagina or uterus to do this, nor to prevent clotting of the blood if they were present, as was shown by the formation of a good clot within ten minutes when a normal sodium fluoride solution and a small quantity of fibrin-ferment were added to the hematocolpos fluid.

Lactic acid was found in all the specimens, although in no case were Döderlein's bacilli present; indeed, all the specimens of fluid were sterile with two exceptions, in which there was a colon-bacillus contamination. This shows that the acidity of the vagina is not dependent upon the presence of the Döderlein bacillus, as has often been taught, but to the lactic acid, which is formed by the action of some cellular enzyme on the mucin always present.

Quite different conclusions have been arrived at by Dienst² as the result of investigations into the cause of the non-coagulability of menstrual blood. He first examined menstrual fluid to see if the two substances necessary to produce coagulation—fibrinogen and fibrin-ferment (thrombin)—are present in normal quantities, previous experiments having shown him that not only must both these substances be present in a fluid to produce coagulation, but that they must be present in the proportion of at least 1 part of fibrin-ferment to 215 parts of fibrinogen, otherwise the former is not able completely to convert the

¹ Journal of Obstetrics and Gynecology of the British Empire, 1912, xxi, 209.

² Münch. med. Woch., 1912, lix, 2799.

latter into fibrin. By careful analysis, he says that he has been able to demonstrate in the menstrual fluid a fibrinogen content about equal to that of normal blood. He has found fibrin-ferment to be present also, but in quantities much below normal; this deficiency of the fibrin-ferment (thrombin) in menstrual fluid as compared with the circulating blood he believes to be due to the presence in the endometrium of large quantities of *antithrombin*, which immediately neutralizes most of the thrombin in the blood as the latter issues from the endometrial vessels and capillaries. Examining, then, the endometrium, Dienst has been able, by certain physicochemical tests, to demonstrate the presence of antithrombin—at least to his own satisfaction; he has found it in especially large quantities in the hypertrophic endometrium associated with myomas, and suggests this fact as an explanation for the excessive hemorrhages in these cases. On the same theory, he says that the profuse hemorrhages associated with uterine polyps, in which, of course, there is hypertrophy of a portion of the endometrium, can be explained, whereas the rapid cessation of hemorrhage from the recently delivered uterus is due to the fact that no antithrombin-producing endometrium is present. He does not offer any explanation, however, as to how the antithrombin gets into the endometrium.

Menorrhagia. The question of abnormal uterine bleeding occurring at the two extremes of menstrual life—puberty and the menopause—has been the subject of investigation by two French authors. Weil¹ says that the occasional occurrence of prolonged and profuse uterine hemorrhage at the time of puberty has long been recognized, but has usually been attributed to local conditions, such as uterine lesions, congestions, inflammations, etc., whereas, in his opinion, these hemorrhages are, in most instances, merely one manifestation of a general dyscrasia. He reports 9 cases of this sort, each of which has been most carefully studied from every point of view; no demonstrable genital lesions were present in any of them, but, in almost all, a decided hemophilic tendency had existed since early childhood, the mothers of seven of the girls having suffered from a like condition. Since any hereditary tendency present was on the maternal, and never on the paternal side, however, Weil considers the condition not a true hemophilia, but more purpuric in nature.

In all these patients, blood tests showed a lengthened coagulation time, and the clot, when formed, retracted poorly. In one instance there was a decided family tendency to icteric conditions, and in five there were developmental anomalies, such as obesity, hypoplasia, etc. The whole condition appears to Weil to be due to some functional disturbance in all the glands of internal secretion—ovaries, thyroid, pituitary, adrenals, etc. Organotherapy is therefore indicated, and

¹ Annales de Méd. et de Chir. Infantiles, 1912, xvi, 553.

surgery of any sort is not to be considered. Of the organ preparations, thyroid extract seems to have been the most generally efficient, though each case must be judged individually in this respect. For the control of serious hemorrhage, the injection of normal serum can be absolutely relied upon; it may be given hypodermically in doses of about 20 c.c., and may also be used for vaginal instillation. It is practically a specific, and always produces a marked diminution in the bleeding, even if it does not stop it completely at the first injection.

The hemorrhages occurring around the climacterium are considered by Dalché,¹ who says that while uterine bleeding occurring after the menopause is often due to malignant tumors, it sometimes is not, and that while we should never lose sight of the overwhelming importance of malignancy in making the diagnosis, neither should we overlook the fact that most of the non-malignant cases are amenable to medical treatment, or undergo spontaneous cure, without resource to serious surgical operations. Sufferers from an old metritis, for instance, accompanied by a general visceroptosis, are often subject to severe post-climacteric hemorrhages, as are women with senile metritis. In the latter instance, the hemorrhage is usually accompanied by a fetid discharge, both conditions clearing up, as a rule, after a simple dilatation and intra-uterine lavage. Mucous polyps and fibromyomas are, of course, well-recognized causes of postclimacteric hemorrhage, but the chief point that the author wishes to emphasize is the importance of *syphilis* in this connection. This is a condition which is rarely thought of, yet when it is the underlying factor, failure to make the diagnosis, will result in utterly inefficient treatment. It may manifest itself as a diffuse syphiloma, forming a large uterine and peri-uterine mass; as a gumma, or collection of gummas, forming a friable, nodular mass on the cervix; or merely as a sclerotic condition of the uterus and its vessels, all these conditions being capable of giving rise to metrorrhagias, and all being curable by specific treatment.

In cases of severe menorrhagia, due to the relaxation and congestion of the uterus which often accompanies acute adnexal inflammations, Koch² has found a most efficient method of treatment to be the injection of *pituitrin* or of *ergot preparations* directly into the cervical tissue. After the vagina has been cleansed, the anterior cervical lip is seized with a double tenaculum and held firmly, no traction downward being made, however, and the fluid is then injected through a needle thrust longitudinally 1 to 2 cm. into the cervical tissue. Both pituitrin and preparations of ergot have been used in this manner, the former in doses of from $\frac{1}{2}$ to 2 c.c. With the ergot preparations, immediate and absolute cessation of bleeding results in practically all cases; with pituitrin the result is just as prompt, but, as a rule, the bleeding,

¹ Gaz. des Hôp., 1912, lxxxv, 3.

² Arch. f. Gyn., 1912, xciv, 297.

though reduced to an insignificant amount, does not entirely cease, showing that the contraction of the uterine muscle in this instance is not so intense. In from twelve to twenty-four hours after the use of either substance, a secondary relaxation occurs, with renewed hemorrhage, usually necessitating a second injection. Although the action of ergot is the more powerful, it is accompanied by rather severe toxic symptoms which are not produced by pituitrin, so that the author considers this the preparation of choice.

By this method of intracervical administration, Koch says that he has been able to control threatening hemorrhages in a number of cases which had resisted all other forms of therapy, including the subcutaneous injection of pituitrin. The principal objection to the intracervical injections is that they are usually accompanied by considerable pain. This can be reduced to a minimum by holding the uterus as immobile as possible, but the insertion of the needle always causes it to move a little, which is bound to produce some pain on account of the acute inflammation of the pelvic peritoneum present in these cases. The rapid effect of drugs thus applied, as well as their toxic manifestations, are believed by the author to be due to their action on the cervical ganglion of the sympathetic, which is situated directly adjacent to the posterior cervical wall, and whose fibers ramify throughout the entire cervix.

Amenorrhea. *Pituitary preparations* have been used also in the treatment of certain forms of amenorrhea by Hofstätter,¹ who says that he has been much pleased with the results obtained in a fair proportion of the cases. He considers this form of treatment indicated in those cases in which the amenorrhea is due to congenital hypoplasia of the uterus or ovaries, general infantilism, lactation atrophy of the uterus, anemia, cachectic conditions, or slight adnexal disease. He has treated 33 such cases with subcutaneous injections of pituitrin, supplemented by the oral administration of the drug in tablet form; in about two-thirds of the patients there appeared, after a few injections, a bleeding from the genitalia, which had all the subjective and objective characteristics of true menstruation, but in only about one-third were subsequent decreasing doses able to keep up a permanently recurring flow, and in but a few scattered instances was the stimulus, once given, sufficient to induce permanent, spontaneous menstruation. Even in the cases in which no actual bleeding was produced, however, the general condition of the patients was always rapidly and decidedly improved. The author tried various preparations from different firms (Parke, Davis & Co., Hoffman-La Roche, Richter), but could not see any marked difference in efficiency.

One of the pituitary preparations, *pituglandol* (Hoffman-La Roche),

¹ Zentralbl. f. Gyn., 1912, xxxvi, 1536.

has also been used by Fromme¹ in the treatment of amenorrhea due to disturbances in the ovarian function, on the theory that it might replace or supplement an insufficient ovarian secretion, since it seems highly probable that the glands of internal secretion are capable of assuming each other's functions to a certain extent, at least temporarily. He selected for his investigations only patients in whom a beginning pulmonary tuberculosis, or other constitutional condition that might be responsible for the amenorrhea, could be definitely excluded. The dosage was 1 c.c. daily, given by subcutaneous injection, for varying periods up to one month. So far, he has had opportunity to try this form of treatment on only 12 patients; in 5 no improvement whatever was produced; in 2 there was perhaps slight improvement, but in the other 5 prompt relief from the amenorrhea followed. In all of the last group, profuse menstruation appeared, but none of them has been followed for a longer period than three months, so that the author is unable to say anything as to the permanent effects. From this rather small series of cases, however, he has gained the impression that the best results are obtained with patients in whom there has been a rather rapid increase of fat, indicating a functional disturbance of some of the ductless glands.

Dysmenorrhea. Jacobs² reports 3 cases in which he has used *radium in the treatment of dysmenorrhea membranacea*. His technique was to dilate the cervix with laminaria tents, and then to introduce a tube containing 1.5 cg. of radium into the uterine canal. This was left in place for one hour, the treatment being repeated once a week for three weeks. He reports great relief of the dysmenorrhea in all 3 patients, the improvement being very noticeable even after the first treatment.

Tubal Menstruation. Evidence in support of the not generally accepted idea that the tubal mucosa partakes in the menstrual process is furnished, according to Hirschberg,³ by 2 cases of tubal fistula which he has observed. In both of these, the fistula resulted from an incomplete operation for tubal disease, a fistulous tract, communicating with the lumen of the tube, remaining at the lower angle of the wound. In each instance, blood was passed from the fistula at each period; this could not be considered a vicarious menstruation, as the normal menstrual discharge was present as well. That the blood escaping from the fistula had originated in the uterus, and had flowed back through the tube, does not seem to the author probable, on account of the extremely small size of the tubal lumen at the uterine end, and of the lack of any obstruction to the discharge of blood through the cervix. He considers, therefore, that it originated in the tube, as a result of a true menstrual activity of the tubal mucosa.

¹ Zentralbl. f. Gyn., 1912, xxxvi, 1366.

² Rev. Mens. de Gyn., d'Obst., et de Péd., March, 1912.

³ Berlin. klin. Woch., 1912, xlix, 1748.

THE OVARY

Physiological Action of the Ovarian Secretions. Extensive investigations into the physiological activity, or so-called internal secretory function of the ovary, have been carried out by Schickele.¹ He has worked almost exclusively with what he calls "Pressäfte," *i. e.*, extracts obtained by mixing finely chopped tissue with quartz sand and Kieselgur, and then subjecting this to a pressure of from 400 to 500 atmospheres. His investigations have been carried out chiefly from two points of view: (1) To determine the power of such pressure extracts to inhibit coagulation of the blood, and (2) to test their action in lowering blood pressure when injected into the veins. In these experiments, Schickele has not confined himself to ovarian extracts, but has investigated those from the uterus, fibroid tumors, thymus, thyroid, adrenals, testicle, and other organs as well; he has used for controls extracts of normal muscle tissue.

Most of the coagulation experiments were made with goose-plasma, which proved, for various reasons, to be a very suitable medium. The author found that whereas normal muscle extract produces coagulation of the plasma in from one to five minutes, uterine or ovarian extracts prevent this for as long as from two to five days; he also found that extracts of most of the other organs mentioned exhibit a certain amount of inhibitory power, but that this is extremely feeble compared with that of the genital organs. Extracts of corpora lutea alone show just about the same degree of activity as those from entire ovaries, but with regard to the relations in this respect between the uterus and ovaries, some very interesting points have been brought out, namely, that in cases which clinically had suffered from excessive menstrual bleeding, the inhibitory action of the uterus is noticeably greater than that of the ovaries, whereas in cases without abnormal menorrhagia, the ovaries show greater activity than the uterus. In other words, a diminution in ovarian activity seems to be associated with excessive uterine bleeding. It was further noted that extracts of the uterine mucosa are always more powerful than those of the myometrium, and that the action of fibroid tumors is less intense than that of the uterus.

The pressure extracts are always slightly acid; by neutralization and filtration their activity is largely destroyed, but still more so by dialyzing. It seems probable that these extracts depend for their activity on the presence of endocellular substances, which have been liberated during the process of mixing the tissue with sand and the subsequent expressing, for no such action is exhibited either by watery extracts

¹ Münch. med. Woch., 1911, lviii, 123; Biochem. Zeitschr., 1912, xxxviii, 169; Arch. f. Gyn., 1912, xcvi, 409.

or by finely chopped bits of tissue. Schickele believes that the inhibitory substance probably belongs to the hirudin group, and that it contains an antithrombin; whether an antikinase is also present, he has not as yet been able to determine.

Although blood from the general circulation of individuals whose organs show marked inhibitory action possesses no activity in this respect, not even when taken at the menstrual period, the *menstrual blood* itself not only remains uncoagulated for weeks and months when carefully collected in suitable vessels, but a few drops of it will exert a powerful anticoagulating action on the goose-plasma. That this action is really due to the presence of an active antithrombin is shown by the fact that if to a mixture of goose-plasma (containing no thrombin) and horse serum (containing thrombin) a few drops of menstrual blood are added, coagulation is inhibited for more than ten days, whereas without the addition of menstrual fluid it occurs very quickly.

From these experiments, the author concludes that the ovaries, uterus, and menstrual blood all contain an antithrombin of great activity. That this substance is identical in all three localities is indicated by the fact that extracts from ovaries or uteri removed after the menopause do not show any greater coagulation-inhibiting action than those from any other organs—in other words, all their specificity is gone. In view of the close functional relationship between the uterus and the ovaries, it seems natural to consider the latter the source of the antithrombin, which is probably elaborated by them as an internal secretion, and is then carried by the circulating blood (but in too small quantities to be demonstrable) to the uterus, which stores it up, and from time to time excretes it, as it were, as a material useless to the organism.

With regard to the *blood-pressure-reducing action of ovarian and uterine extracts*, Schickele says that for a long time substances having this effect have been known to be present in the ovaries, but that this action has not been shown to be specific, as many organ extracts have a similar effect when injected intravenously. He wished, therefore, to ascertain if the substance causing this could also be demonstrated in the uterus and in menstrual blood, and if it had any relation to sexual activity. He used, in these investigations, both pressure extracts, and extracts made with boiling alcohol, finding both of these far more uniform in action than the cold alcoholic or salt solution extracts used by most other experimenters. He found a regular depressor action on the blood pressure to be exerted by extracts of uterus, ovaries, tubes, and myomas, and also of corpora lutea alone, and of ovaries from which all corpora lutea had been removed. Neither immunity nor anaphylaxis is produced by repeated subcutaneous or intravenous injections. If the blood pressure is first reduced with one of these extracts, and then adrenalin is given, a quantity of this much

larger than usual is required to produce the typical rise; if both are given together, there may be no change in pressure. If thyroid extract is first given, causing a slight fall, and then ovarian extract injected, there is a still further fall, showing that a summation of effect occurs. The action of these extracts is a local one on the bloodvessel walls, as is shown by the fact that a few drops in the eye cause a marked, and fairly persistent, dilatation of the conjunctival vessels. The depressor substance is thermostabile, and is not precipitated by potassium iodide, by platinum chloride, or by cadmium chloride solutions; it cannot, therefore, be reckoned among the proteids, alkaloids, or bases of the cholin group, but is possibly closely related to the lipoids.

The depressor substance, just as the antithrombin, is present in the ovaries before puberty, but not after the menopause. It is also present in the menstrual blood. It also, in all probability, arises in the ovaries, and is likewise carried to the uterus in the circulating blood; this has not been definitely demonstrated, but the occasional occurrence of vicarious menstruation is an indication that it may, at times, get into the systemic circulation in large quantities. Both in animal experiments and in 2 clinical cases, Schickele has seen the injection of corpus luteum extract followed by a distinct hyperemia of the external genitalia, similar to that associated with early pregnancy in women and with rut in animals; it would seem, therefore, that the vasodilator action is more marked in the vessels of the genitalia than in other parts of the body.

The Corpus Luteum. The well-known theories of Fraenkel¹ as to the necessity of the presence of functioning corpora lutea for the maintenance of gestation in its early stages have been confirmed by Dick and Curtis² by means of experiments on 14 rabbits. Having demonstrated the correctness of the idea that the corpus luteum actually produces some substance, presumably of the nature of a hormone, which exerts a specific influence on the development of the embryo, these investigators went farther, and tried to see if an anti-corpus-luteum-serum could be produced by subjecting the corpora lutea of beef ovaries to a process by which their nucleoproteid was extracted, and then injecting other animals with this substance. For this purpose, roosters and guinea-pigs were injected at intervals of a few days with increasing amounts of cow corpus-luteum nucleoproteid, and the serum of these animals then used for agglutination tests with suspensions of finely ground corpus luteum. No evidence was seen of the formation of specific antibodies, nor could any activity of the corpus-luteum nucleoproteid in compensating for the loss of normally functioning corpora lutea be demonstrated, since in no instance

¹ Arch. f. Gyn., 1903 and 1910.

² Surgery, Gynecology, and Obstetrics, 1912, xv, 589.

was its injection able to prevent the absorption of embryos after the removal of the animal's own ovaries.

CORPUS LUTEUM EXTRACT. An interesting report of the therapeutic use of corpus-luteum extract is made by Burnam,¹ who has been using it in conjunction with Kelly for several years. They have become convinced, from their clinical experience, that the corpus-luteum plays the principal, if not the chief, role in the internal secretory activity of the ovary so far as it has to do with causing menstruation, and so far as it represents the tissue whose removal brings on the nervous manifestations of the menopause. Kelly and Burnam have worked almost exclusively with the corpus-luteum of the sow; at first they used fresh material, but soon gave this up for the dried product, which is now prepared for them in tablet form by a drug firm in Baltimore, each tablet representing 20 grains of fresh gland. They deteriorate with age, but when used fresh are apparently as efficient as the raw material. In 90 per cent. of the cases treated, the hot and cold flashes, great irritability, and other manifestations of the menopause, have been greatly diminished; in a few cases there has been no improvement, and one patient was apparently made worse, without any cause for this being discoverable. The dosage varies with the individual, ranging from 1 to 20 tablets a day, but it seems probable that even larger doses might be given, were it not for the expense. When relief occurs at all, this usually becomes manifest within a day or two after starting the treatment. With some patients the drug can be stopped after a few weeks, but with others it must be continued; several have now been taking it for over a year.

In one class of patients, most striking results have been obtained. These are women of the neurasthenic type, usually aged over thirty-five years, who complain of great nervousness, fatigue on the least mental or physical effort, some frequency of micturition, and slight dyspeptic symptoms. Menstruation may be normal, and the pelvic examination negative, yet it is remarkable how quickly and completely some of these patients will respond to lutein therapy. Burnam's method of treating cases of this sort has been to give about 9 tablets a day for ten days immediately preceding the menstrual period, 6 a day during the flow, and 3 a day from the end of one period till ten days before the next, when the dose is again increased to 9. He believes the improvement in these individuals to be due to the reestablishment of a broken compensation between the glands of internal secretion, possibly caused by insufficient ovarian activity. Rest and freedom from care are adjuncts to the treatment, but are by no means essential.

Actual amenorrhea, following real or artificial menopause, does not seem to be benefited by lutein therapy, but the functional amenorrhea

¹ Journal of the American Medical Association, 1912, lix, 698.

of young girls often is, and the treatment has also been efficacious in increasing the amount and duration of the flow when this has been scanty; in other words, corpus luteum extract seems able to supplement an insufficient ovarian activity, but not to replace one that is totally lacking. It has been tried also in a few cases of dysmenorrhea, sterility, and habitual abortion, but without any appreciable result.

Decidedly beneficial results from the use of corpus luteum extract in the treatment of 3 cases of kraurosis vulvæ are reported by Schiekele.¹ The most marked of these occurred in a nulliparous woman, aged thirty-seven years, both of whose ovaries had been removed for cystoma at the age of twenty-four. This had been followed by the development of a very severe kraurosis, with such intense vulvar pruritis, ulceration, and rhagades-formation that the patient was confined to bed. All local treatment having been without effect, she was placed on a daily dose of gtt. xx of a concentrated alcoholic corpus luteum extract, but this amount had to be somewhat reduced because of severe headaches. By the eighth day of this treatment the pruritis had almost disappeared, and had given place to a feeling of warmth about the genitalia; in less than three months the patient was entirely cured of all symptoms, and the vulva had assumed an almost normal appearance. In the other 2 cases the kraurotic changes were not so advanced, and the results were equally satisfactory.

Conservative Surgery of the Ovary. The question of whether or not to remove ovaries which are the seat of slight or moderate pathological changes, associated with inflammatory processes in the other internal genital organs, is one about which there is always room for much individual difference of opinion, but it is safe to assume that the vast majority of operators today believe in some degree of conservatism in dealing with these cases. A valuable study of this subject has been made by Polak,² who reports the late results in 229 cases operated on by him since May 1, 1909, in which some form of conservative procedure on the ovary was practised. In 60 of these patients, both ovaries were left *in situ* after freeing adhesions and removing diseased tubes and uteri; in 102, one ovary was removed and one left; while in 67, more or less extensive resection was performed. Of the 229 patients, 181 have been followed, and examined from time to time, with very gratifying results. Only 24 secondary operations were necessary, 21 for the removal of the remains of a previously resected ovary, and 3 for the extirpation of a conserved ovary.

The author makes a sharp distinction between *resection* and *conservation*. The latter, he believes, should be much more frequently practiced than the former, which should be restricted to the treatment of ovaries the seat of a single, good-sized cyst, small dermoid, or

¹ Arch. f. Gyn., 1912, xevii, 409.

² Journal of the American Medical Association, 1912, lix, 2138.

fibroma. Organs in which other pathological changes—especially the exceedingly common “microcystic degeneration”—are present should either be left alone or removed entirely. These conditions are usually the result of interference with the efferent circulation, due largely to malposition, this causing a thickening of the tunic; such ovaries, if brought up into good position in such a way that their blood supply is not interfered with, will often show an amazing amount of regenerative power. Where resection is deemed advisable, it should be sufficiently extensive to remove the entire diseased area, and the line of suture should then be covered over with a reflexion of peritoneum to prevent intestinal adhesions.

Polak has made the interesting observation that the right ovary, when retained, is apparently less apt to give trouble than the left, an experience which is confirmed by Taussig,¹ who suggests that this may be due to the greater proximity of the intestine on the left side.

As a result of these careful studies, Polak has arrived at the conviction that although the internal ovarian secretion has an importance in the life of woman which cannot be overestimated, so that every effort should be made to conserve an ovary where this is possible, it should not be forgotten that retention of a distinctly unhealthy ovary will leave the patient in a worse state mentally, nervously, and physically than if total extirpation had been performed, and that there is probably no field of surgery in which long experience, and an accurate knowledge of living pathology, is of so much importance as in deciding what to do with a particular ovary which is enlarged to two or three times its normal size.

GONORRHEA IN THE FEMALE

Complement-fixation Test. Extensive and careful investigations into the possibility of applying the principle of complement-fixation to the diagnosis of gonorrhea have been carried out by Schwarz and McNeil.² Their technique is, in general principles, similar to that of the Wassermann reaction for syphilis, but is more specific, in that the antigen is prepared from actual cultures of the gonococcus, whereas in the Wassermann test it is obtained from non-specific organ extracts. In preparing their antigen, the authors use a number of different strains of gonococci, as they have found that the gonococcus is not a single entity, but that there are numerous varieties, differing sufficiently from each other that an antigen prepared from one will give no reaction with members of other groups, the best results being obtained, therefore, from a polyvalent culture. The technique is, very briefly, to grow

¹ Discussion of Polak's paper; loc. cit.

² American Journal of the Medical Sciences, 1911, cxli, 693; Ibid, 1912, cxliv, 815.

about a dozen different strains of the organism on neutral, salt-free veal agar for twenty-four hours; the growth is then washed off the agar slants with distilled water, and the resulting suspension heated for two hours to 56° C., centrifuged, and passed through a Berkefeld filter. To 9 parts of this antigen, 1 part of 9 per cent. salt solution is added before use, making a physiological, 0.9 per cent. salt solution. In sealed tubes, antigen thus prepared will keep almost indefinitely. For the past few months the authors have been using, coincidentally with their own, an antigen prepared by Parke, Davis & Co., and have found it very satisfactory. The technique of carrying out the test is practically the same as for a Wassermann reaction, except that only one-tenth of the quantity of all the ingredients is used.

Schwarz and McNeil have tried the reaction in a large series of cases, and have found that a *positive* result is practically specific for gonorrhea. The only instance in which a positive reaction was obtained with a non-gonorrheal serum was in testing the gonococcus antigen against a highly immune antimeningococcus serum prepared according to Flexner's method; several samples of sera from patients with cerebrospinal meningitis gave, in all instances, negative results, however, so that, clinically, this source of possible error seems to be of no importance. A *negative* reaction, on the other hand, does not absolutely exclude the possibility of gonorrhea, the same condition being true, of course, with regard to the Wassermann test. It would seem, however, that more value can be placed on a negative gonococcus reaction than on a negative Wassermann, for two reasons. In the first place, late syphilitic lesions tend to become encapsulated, so that there is not free absorption of toxins, with consequent poor antibody formation, and, in the second place, the Wassermann reaction is often obscured by mercuric treatment, but there is no treatment which can thus affect the complement-fixation test for gonorrhea.

As a rule, the positive reaction for gonorrhea does not appear earlier than the fourth week, and even then only in severe cases. It persists, however, for about seven or eight weeks after the disease has been cured, and the authors believe that one of its chief applications will be in testing the reality of apparent clinical cures, for tests in a large series of cases by Keyes,¹ Schmidt,² and themselves indicate that there is an average clinical error of about 13 per cent. in judging of the attainment of a cure, *i. e.*, that in about this proportion of all cases considered to be cured, the presence of gonococci, and therefore the possibility of spreading infection, can be demonstrated by the complement-fixation test. The authors consider that any patient, whose serum gives a positive reaction later than eight weeks after being apparently cured, should be looked upon as still harboring gonococci.

¹ American Journal of the Medical Sciences, January, 1912.

² Journal of the American Medical Association, 1912, lviii, 1307.

Owing to the great difficulty in positively diagnosing many cases of chronic gonorrhea in women, either by smears or cultures, because of the large number of other organisms present, Schwarz and McNeil believe that one of the most important uses for the complement-fixation test will be in this class of cases. In patients with involvement only of the urethra and of Skene's and Bartholin's glands, but not of the cervix or deeper structures, the reaction will probably be uniformly negative, but such cases are, of course, rare, except in children. Ten cases of vulvovaginitis in children, for instance, with positive smears and cultures, all gave a negative reaction. The following table shows the gynecological cases in which the reaction has thus far been tried, and the results obtained:

CLINICAL DIAGNOSIS		Positive.	Negative.
Urethritis and endocervicitis:			
(a) Gonococci present	9	0	
(b) Gonococci not found	8	3	
Gonorrhea, clinically cured	1	4	
Chronic gonorrhea; gonococci not found	2	0	
Gonorrheal vulvovaginitis; gonococci present (girls under five years)	0	10	
Salpingo-oöphoritis	9	3	
Pyelitis, clinically considered gonorrheal	2	0	
Vulvovaginal abscess, gonorrheal	2	0	
Pelvic peritonitis	3	1	
Pregnancy; gonococci present	1	0	
Pregnancy; gonococci not found	14	49	
Miscellaneous cases from clinic; lacerations, displacements, etc.	13	50	
Pyosalpinx	3	4	
Pelvic abscess	0	2	

One of the cases included in the table, diagnosed clinically as pyosalpinx, but giving a negative test, was found at operation to be really a cystic ovary, with normal tubes, and one diagnosed as pelvic abscess was found to be an ovarian abscess, from which the *Bacillus coli* was obtained in pure culture, so that the negative reactions in these instances were entirely justified.

Confirmatory evidence as to the value of this test in the diagnosis of gonorrhea is given also by a number of other investigators, notably Smith,¹ O'Neil,² and Gardner and Clowes,³ all of whom have tried it on a number of cases, with approximately similar results.

Cultural Methods of Diagnosis. Van de Velde,⁴ of Haarlem, says that the ordinary examination of smears can no longer be considered a

¹ Lancet-Clinic, August 3, 1912.

² Boston Medical and Surgical Journal, October 3, 1912.

³ New York Medical Journal, October 12, 1912.

⁴ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxv, 447.

scientific method of diagnosing gonorrhea, as there is a whole series of Gram-negative diplococci which very closely resemble gonococci, and which are at times intracellular in situation. He cites as an illustration a case of infantile vulvovaginitis, from which was obtained a culture of anaërobic pseudogonococci having morphological identity with true Neisserian organisms. He maintains that in view of these sources of error, as well as of the great difficulty in demonstrating organisms in true gonorrheal infections of long standing, our dependence should be placed much more on *cultures* than has heretofore been the case. The chief reason for the slight amount of attention given by gynecologists to this method of diagnosing gonorrhea the author believes to be due to the supposed difficulty of growing the gonococcus; this he has found to be much exaggerated, however. For simple diagnostic purposes, Van de Velde has found "Thalmann-agar" very satisfactory, as gonococci generally grow on it readily; it has the great drawback, however, that most of the other organisms found in the female genital tract grow on it also, so that with it pure cultures cannot be obtained. For this purpose, ascites-agar is much better, since gonococci grow equally well on it, while most other organisms do not. Anyone attempting this work should remember, however, that while some ascitic fluids furnish splendid culture media for the gonococci, others will not support them at all, so that each new specimen of fluid must be tested, and those found efficient carefully preserved. After a pure culture has once been obtained, it is well to transfer subsequent inoculations back to the Thalmann-agar, in order to spare one's stock of ascitic fluid. For the preservation of stock cultures, the author has found ascitic-bouillon very satisfactory, as the organisms maintain their vitality in this for at least a month.

When Gram-negative diplococci are found which grow on these special media, but which show no growth on ordinary ones, the probability is very great that they are true gonococci; there is a possible source of error, however, in the fact that occasionally true gonococci do grow for a time on non-specific media, and, on the other hand, they may fail to grow on the special ones. In these doubtful cases, our next resort must be to the determination of the opsonic index. Van de Velde has tried this in a number of cases, and has come to the conclusion that a low index to gonococci, found at each of several estimations, is almost positively diagnostic, whereas a normal index is of no value either way, as it may exist in a frankly positive case of gonorrhea. All these laboratory results are to be considered as adjuncts to the clinical diagnosis, and in no sense as replacing this, however.

Vaccine Diagnosis of Gonorrhea. Another procedure of great value in diagnosis, the same author¹ has found to be vaccination with dead

¹ Loc. cit.

gonococci. He considers an initial dose of 15,000,000 to 40,000,000 organisms sufficient in most instances to produce a decided negative phase, with focal reaction, consisting of increase in size of adnexal tumors, increased tenderness, occasionally fever, and often increased discharge. The last mentioned point is very important, as frequently in the freer discharge gonococci are brought to light, where formerly none could be demonstrated. This diagnostic vaccination should be limited strictly to chronic cases, and care should be taken not to give too large an initial dose. Here, again, a negative reaction is of less value than a positive one, as the dose may have been too small, or the strain of organism used may not have been the same as that with which the patient was infected.

In the course of applying vaccine treatment to several hundred gonorrheal cases in a gynecological dispensary, Sternberg¹ has observed that in all patients subsequently found to be suffering with true gonorrhea the first or second vaccine injection is always followed by distinct and characteristic reactions, which he and his assistants have come to consider of great diagnostic value. His method is to give at the first injection 0.3 c.c. of a suspension containing 100,000,000 dead gonococci to the cubic centimeter. If no reaction occurs, the dose is doubled at the second injection. As in all other forms of immunity reaction, the disturbance may be local—at the point of injection, focal—at the chief seat of the disease, or general. Sternberg's endeavor is to avoid the local and general reactions, depending upon the focal disturbance alone; he has found the above-mentioned dosage best adapted to accomplish this in the majority of patients.

This focal reaction in the class of cases under consideration consists chiefly in a softening and diminution in tenderness of parametric indurations, and sometimes in a marked increase in the amount of discharge. On the first day after the initial injection, some increase of pain in the pelvic region may be complained of, but this soon disappears. The uterus becomes more freely movable, and less sensitive to manipulation; where large, painful adnexal masses are present, similar changes usually take place in them also.

In order to test the specificity of these reactions, Sternberg has given injections of similar doses of vaccine to several normal individuals, and to patients suffering from perimetric exudates and scar-formation of non-gonorrheal origin, tubal pregnancy, and other conditions, with entirely negative results, the distinction being especially sharply brought out in the ectopic cases. He believes, therefore, that this method of diagnosis is a most valuable addition to those in every-day use.

Fromme,² however, writing on the same subject, says that he has

¹ *Gyn. Rundschau*, 1912, vi, 701.

² *Berlin. klin. Woch.*, 1912, No. 21.

found neither the local nor the focal reaction of any value in diagnosis, as both may occur in non-gonorrheal cases, but he does believe that a rise in temperature, amounting to 1° C. or more, after injection of a gonorrheal vaccine, indicates a specific reaction.

Histological Diagnosis of Gonorrheal Salpingitis. As is well known, Schridde¹ has advanced the hypothesis that gonococci produce very definite, specific changes in the tube, from which it is possible to differentiate, histologically, a pyosalpinx of gonococcic from one of streptococcic or other origin, even though no organisms are demonstrable by smears or cultures. These characteristic changes he considers to be as follows. In the gonorrheal tube the pus in the lumen contains leukocytes, lymphocytes, and especially *plasma cells*; the folds of the mucosa are swollen, plump, and show intense infiltration with the same types of cells, here again the plasma cell being the most important. The surface epithelium is destroyed over large areas, with resulting extensive adhesions between adjacent plicæ. In the walls of the tube is likewise much round-cell and plasma-cell infiltration, with connective-tissue increase, and abscess formation. The picture which Schridde advances as characteristic for pyosalpinx of any other origin than gonorrheal is quite different: here the pus in the lumen consists almost solely of leukocytes, the folds of the mucous membrane are much less swollen, show but slight infiltration, chiefly with leukocytes, and the surface epithelium is everywhere well preserved, so that there are no adhesions between adjacent folds; the tube wall remains almost normal. He emphasizes throughout that the most important elements are the plasma cells; "when they are present in any considerable numbers in the pus, one is justified in making the diagnosis of gonorrhea of the tube."

A very decided word against these views has recently been spoken by Miller,² who criticises Schridde and his followers on the ground that their investigations have been carried out almost exclusively on gonorrheal tubes, without a sufficiently careful comparison with cases of salpingitis of other origin, to determine whether or not the so-called gonorrheal characteristics can be found with any degree of regularity in them as well. Merely on theoretical grounds, Miller says that it is hard to understand why plasma cells should exhibit in the tube a specificity of origin which they do not show in any other part of the body. They occur, as is well known, with considerable frequency in various infectious granulomas, in different types of inflammatory granulation tissue, in the brain in a variety of conditions, in the primary lesions of syphilis, and in numerous other locations, where, as has been demonstrated by many independent investigators, their presence does not permit of any conclusions as to etiology.

¹ Deutsch. med. Woch., 1908, xxxiv, 1251; *ibid.*, 1909, xxv, 1293; "Die eitrigen Entzündungen des Eileiters," Jena, 1910.

² Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxvi, 211.

In addition to these theoretical objections, Miller offers the results of the careful study of a number of cases of salpingitis of non-gonorrheal origin. Thus, in several cases of tuberculous pyosalpinx he has found plasma cells to make up as high as 25 per cent. of the elements of the exudate in the lumen, and in old tuberculous pyosalpinges he has found histological pictures agreeing in all details with those advanced by Schridde as characteristic for gonorrhea. The same is true with regard to several cases of streptococcic tubal infection *post abortem*, in which there were no grounds for suspecting the presence of gonorrhea at any time. One case of especial importance in this regard was that of a *virgo intacta*, aged nineteen years, suffering from a large peri-appendicular abscess. At operation, the right tube was found greatly thickened and adherent to the appendix; in the lumen of the tube were two fecal concretions. In this instance, the occurrence of an antecedent gonorrhea could be, so far as lies within the bounds of human possibility, absolutely excluded, yet on histological examination the swollen tube showed all of Schridde's typical characteristics.

Miller concludes, therefore, that that author's criteria are all worthless, so far as making a differential diagnosis is concerned, and that we do not possess at present any method of distinguishing, histologically, a gonorrheal from a streptococcic or staphylococcic salpingitis, except in the early cases in which it is possible actually to culture or to stain the invading organisms.

That this subject is of more than mere academic interest is shown by the extremely active discussion which was aroused by the presentation before one of the German societies of this paper, together with one by Schridde, reiterating his views. This discussion,¹ the report of which occupies thirteen pages of fine print, was participated in by a number of the leading German gynecologists; the consensus of opinion was decidedly favorable to the standpoint of Miller, and against that of Schridde, the latter being supported only by Krönig and Aschoff, his co-workers at Freiburg.

Wolff,² working in Miller's laboratory at Heidelberg, has come to practically identical conclusions with that author, as the result of a series of differential counts which he has made on the cells found in the exudate in the lumen of about 25 pus tubes of various origin. He says that he has found plasma cells in greater quantities in cases of tuberculous and streptococcic salpingitis than in the average case of gonorrheal infection; he does not think, therefore, that any weight can be placed on the cell picture of tubal pus in determining the etiology of the condition.

A somewhat middle ground on this question is taken by Heynemann,³ of Halle. He has examined 47 cases of pyosalpinx, 2 of these

¹ Monatsschr. f. Geburtsh. u. Gynäk., 1912, xxxvi, 238.

² Zentralbl. f. Gyn., 1912, xxxvi, 1641.

³ Zeitschr. f. Geburtsh. u. Gynäk., 1912, lxx, 870.

being postmortem specimens from patients with acute puerperal infection, the others all removed from more or less chronic cases by operation. In 10 of these he was able to demonstrate the presence of gonococci, in 5 streptococci, and in 1 staphylococci. In 1 of the streptococcic cases, and in 1 in which no organisms could be demonstrated, the histological picture of tuberculosis was present. In the other 30 cases no organisms, or characteristics of tuberculosis, could be found. In the 7 cases definitely due to organisms other than the gonococcus, the mucosa was always less affected than in the gonorrheal tubes; the plicae were not so much thickened, the epithelium was well preserved, and there were few or no adhesions between adjacent folds, but plasma cells were present in all, the 2 tuberculous cases being much the richest in these. The 30 cases in which no organisms could be demonstrated all showed the general histological characteristics described by Schridde for gonorrheal pyosalpinx, and there was no clinical reason to think that these may not have all been really gonorrheal in origin; in a large proportion of them such a history was obtained.

Owing to the possibility of mixed infection in the tube, Heynemann considers it exceedingly difficult to come to a definite conclusion as to the relation between the histological findings and the causative organism. As a result of his investigations, he has decided that while the presence of plasma cells is not alone sufficient to establish the diagnosis of gonorrheal pyosalpinx, such tubes do, in the large majority of instances, show the general group of characteristics described by Schridde, which may, therefore, taken as a whole, be considered to furnish at least presumptive evidence as to the nature of the infection, although undoubtedly individual exceptions from the rule may occur in both gonorrheal and non-gonorrheal tubes.

Ploeger¹ takes a very similar position with regard to this question. He has examined 40 Fallopian tubes microscopically and bacteriologically, and has found, in some instances, a loss of surface epithelium, numerous adhesions between adjacent folds, and large numbers of lymphocytes and plasma cells present in tubes whose infection was clearly demonstrated to be due to the streptococcus or diplococcus lanceolatus; on the other hand, he has found gonorrheal tubes—even of long standing—which showed no plasma cells at all. These cases were decidedly in the minority, however; in the majority of those in which Schridde's characteristics were found the diagnosis of gonorrhea appeared justified clinically, and Ploeger therefore believes that in most tubes of this type, where no organisms can be demonstrated, it is safe to conclude from the histological picture alone that the infection was gonorrheal in origin.

Gonorrheal Peritonitis. An attempt has been made by Albrecht² to settle the much-discussed point, as to whether the gonococcus alone,

¹ Arch. f. Gyn., 1912, xcv, 634.

² Münch. med. Woch., 1912, lix, 2268.

without mixed infection, can cause a generalized, purulent peritonitis. Many prominent gynecologists, such as Bumm and Fromme, deny this absolutely, saying that all such apparent cases are really due to a flooding of the peritoneal cavity with pus from old gonorrheal tubes; they believe that the gonococcus can produce a general peritonitis only when in symbiosis with some other organisms. Albrecht is a firm believer in the opposite view, and points to the fact that the same discussion has been gone through with in regard to the possibility of the gonococcus alone producing infection of other serous surfaces, such as the endocardium, pericardium, and joint cavities, all of which discussions have been definitely answered in the affirmative.

In support of this view, he reports 4 cases which certainly seem pretty conclusive. All the patients came to operation, all had practically identical symptoms before operation, and all ran a similar postoperative course. The most carefully studied case was that of a young girl, admitted with the diagnosis of acute peritonitis from a ruptured appendix. At operation, the peritoneal cavity was found full of creamy pus; the appendix was normal, but both tubes were swollen, and were exuding pus from their abdominal ends. The entire serosa was acutely inflamed, and was covered in places by small patches of fibrin. Smears from the pus showed enormous numbers of gonococci, but no other organisms; a bit of serosa rubbed off from the intestine also showed large numbers of gonococci in the endothelial cells, and inoculations from the pus on Pfeiffer's blood-agar gave a growth which proved to be a pure culture of gonococci. In the other cases, smears likewise showed only gonococci, but no cultures were made.

In all these patients, the onset was sudden and stormy, and in all, the symptoms disappeared almost immediately after removing the pus. Gonorrheal peritonitis seems, therefore, to run a very benign course, as compared with that of other origin, but immediate operation is indicated in all cases, because of the impossibility of making a positive diagnosis.

SURGERY OF THE PERITONEUM

The surgical treatment of the peritoneum, in all its aspects, but especially from the point of view of the gynecologist and obstetrician, formed one of the assigned topics for consideration at the Sixth International Gynecological Congress, held in Berlin last September. Almost thirty reports and papers on the subject were presented by representatives of different countries, and a large number of men took part in the discussion. From all this mass of material, the gist of which is presented in the *Zentralblatt f. Gynäkologie*, 1912, No. 40, two prominent facts impress the critical reader: First, that great divergence

of opinion exists, even among men of large experience, as to the best methods of prophylaxis and treatment of peritonitis, and second, that practically nothing radically new or of vital importance has been added to our knowledge of the subject by this extended symposium.

Possibly one of the most interesting phases of the subject considered was the *intraperitoneal injection of camphorated oil* as a prophylactic measure against peritonitis. This method of treatment, originally proposed by Hoehne, was discussed in these pages last year. It is based on the theory that the resorptive power of the peritoneum is a source of danger in the presence of pathogenic organisms, but that its exudate-forming power is of the greatest value, as by the formation of a plastic exudate, absorption of bacteria into the general circulation is hindered or prevented. Hoehne, therefore, attempts to increase this action by injecting into the peritoneal cavity, previous to operations in which infection is feared, 30 c.c. of a 1 per cent. solution of camphor in sterile oil, with the idea of causing a foreign-body-peritonitis, with consequent profuse exudation and blocking of the lymph channels. He insists that, to be of much value, this treatment must be carried out *before* operation, as the results are not satisfactory if the oil is merely introduced after the abdominal cavity has been opened. Notwithstanding Hoehne's enthusiastic support of this treatment at the congress, the concensus of opinion was decidedly against it, only a few other voices being raised in its favor. Some men are willing to give it a more extended trial, but a number of the most prominent German gynecologists, among others Franz, Kroemer, and von Franqué, condemn it unreservedly from the clinical standpoint, and Heimann reports having seen no value from its use in experimental studies on mice.

Another prophylactic measure, of somewhat different character, was advocated by a number of men—Resinelli (Italy), Van de Velde (Holland), and Hannes (Germany). This consists in the *administration of nucleic acid preparations*, with the purpose of *stimulating leukocytosis*. *Serum* and *vaccine treatment* were also spoken of, but not with any very great show of enthusiasm, though Van de Velde reports good results in the treatment of large inflammatory tumors of the adnexa by first opening up any abscesses that can be reached through the vagina, treating the patient for a time with autogenous vaccines, and then going in from above.

The majority of the participants in the symposium insist upon the importance of carefully *covering with peritoneum all raw surfaces* resulting from the removal of tumors or organs, breaking up adhesions, etc., but Meyer, of Denmark, does not believe in this if, in order to accomplish it, any displacement or fixation of organs is necessary, while Veit says that he is so little troubled with "peritoneophobia" that he never bothers to close over any raw surface in the abdominal cavity, and believes that the best healing is secured in this way. With regard to

drainage, the consensus was naturally in favor of employing this only when absolutely necessary, and then through the vagina whenever possible, rather than through the abdominal wound. Hannes describes a combined method used in the Breslau Frauenklinik in cases of the radical abdominal operation for uterine cancer; the parametric tissue on each side is drained by gauze strips carried out through the vagina, the pelvic peritoneum is then carefully closed over these, and a Mikulicz drain inserted into the general peritoneal cavity through the lower angle of the wound. Where abdominal drainage must be employed, some form of the Mikulicz tampon appeared to be the means most generally favored.

A number of the men spoke of the value of *rubber gloves*, but a few have not been able to see any advantage from their use. Kouwer, of Holland, says that the Dutch gynecologists are agreed that the employment of gloves is a detail of no particular importance, but his compatriot, Van de Velde, is one of their most ardent supporters, insisting that not only operations, but all minor procedures and examinations shall be carried out only with the gloved hand. Lovrich, of Budapest, is another surgeon who sees no especial protection in the use of gloves, but as he reports an average mortality of over 8.5 per cent. in a large series of laparotomies, it would seem as though there might possibly be room for improvement in his technique. A warning against placing too much dependence on gloves, when they are used, was given by Hellendall, who has found that even when they are prepared and put on dry, fluid collects in over half the cases, and that this fluid contains numerous organisms, which may be a source of great danger if the glove be punctured.

Quite a number of men, among them Franz (Berlin) and Recasens (Spain), advocate *operating as far as possible by the vaginal route in infected cases*, and make some attempt to close off the general peritoneal cavity at the outset of the operation, the further steps of which are then carried out extraperitoneally. The use of *abdominal flushing* with salt solution or any form of antiseptic was pretty generally condemned, not so much on the ground of spreading infection, as of diluting the natural bactericidal exudates of the peritoneum. Pus, blood, tumor contents, and other fluids which must be removed, should be carefully wiped out with sponges, though, as Meyer brings out, complete removal of blood and other body fluids is not necessary. Jacobs (Brussels) advocates painting all peritoneal surfaces which have come in contact with septic material with a 1 or 2 per cent. *tincture of iodine*, believing that in this way a sterilizing effect, similar to that of iodine on the skin, is produced. The *danger of infection from endogenous organisms* in carcinoma cases was emphasized in a number of the papers, and also of that from organisms in the vagina when this must be opened.

With regard to the *treatment of generalized peritonitis* that has once developed, the necessity of immediate laparotomy, with, if necessary, the establishment of an artificial anus, was spoken of, and also the importance of combating the coincident fall in blood pressure, adrenalin being advocated for this purpose by Holzbach, pituitrin by Klotz, Sellheim, Kroemer, and others. It seems strange to the American reader to find in this connection no mention whatever of the Murphy treatment by continuous enteroclysis.

A French Report on Camphorated Oil. A more favorable opinion on the use of camphorated oil in the treatment of peritonitis than almost any expressed at the congress has been published by two Frenchmen, Vignard and Aranud,¹ who report that they believe it to be of great service in cases of acute, diffuse peritonitis. They introduce into the peritoneal cavity 200 to 300 c.c. of 1 per cent. camphorated oil, and think that it acts in two ways; by inhibiting toxic absorption, and by lessening the formation of adhesions. They are convinced that it possesses the latter property to a very considerable degree, since they have had an opportunity to study, at re-operation or autopsy, a number of cases in which it had been used, and have found, even in the presence of a well marked peritonitis, either no adhesions, or but few, and these much less dense than would ordinarily be the case. The camphor itself seems to exert some tonic action on the heart, and to have some antiseptic value.

The authors state, without giving any statistics, that since they have been using the oil, in conjunction with Fowler's position and proctoclysis, their results in cases of severe peritonitis have been more satisfactory than when the latter methods were used alone, without the oil. Often soon after its introduction into the peritoneal cavity a marked improvement in the patient's circulation has been noted, together with a rapid fall in temperature, and general improvement. One important point is that the oil must be absolutely pure. To obtain this, the authors add to each kilo of oil 300 grams of 95 per cent. alcohol, shake violently, and allow the mixture to stand for twenty-four hours, then decanting off the oil. This process is repeated three times; the oil is then sterilized, and the camphor added.

THE FEMALE URINARY SYSTEM

Diagnosis of Tuberculous Kidney. In an article read last spring before the American Medical Association, Roving² calls attention to the fact that renal tuberculosis was formerly thought to be always associated with albumin in the urine, but he reports having seen a

¹ Rev. de Chir., 1912, xxxii, 773.

² Journal of the American Medical Association, 1912, lix, 2229.

number of cases which disprove this idea. One of these was a very advanced lesion of the kidney, which had become completely transformed into a large mass of caseous material, in which no kidney tissue could be found, this fact accounting for the absence of albumin at the time of examination, though previously the patient had had albuminuria, and had been treated medically for nephritis. In most of his cases of renal tuberculosis without albumin, however, the lesion was very early or extremely limited.

Rovsing considers it very important never to begin the treatment of a case of pyuria, albuminuria, or cystitis, without having previously subjected a specimen of urine, obtained in a sterile manner, to a microscopic and bacteriological examination, as only in this way can serious errors in diagnosis be avoided, such, for instance, as mistaking early tuberculosis of the kidney for simple or gonorrheal cystitis. He claims, some modern text-books to the contrary notwithstanding, that it should be possible to demonstrate the presence of tubercle bacilli in the urine in over 80 per cent. of all cases of renal tuberculosis, and says that he has been able to do this by the simple method of Forsell, *i. e.*, letting the total urine for twenty-four hours precipitate in a separator, taking then the lowest portion of the precipitate, and centrifuging it. For the general practitioner, an excellent tentative diagnosis can be arrived at by simply staining the sediment from a suspected urine with one of the common bacterial stains; the presence of pus cells, *without bacteria of any kind*, is so strongly suggestive of renal tuberculosis that such a case should at once be referred to a laboratory having facilities for the special methods of examination.

The author is a strong advocate of the value of urea estimation in determining the functional value of the unaffected kidney, a method which is not highly regarded by the majority of urologists. He says that he has found a normal urea elimination to be a safe criterion of the sufficiency of renal function; a reduced elimination, however, is of no value one way or the other, as it may be due to kidney disease, to a purely reflex condition (reno-renal reflex), or to impaired activity of the entire organism. Reduced elimination may, therefore, sound a warning to proceed cautiously, but nothing more. He considers all the other functional tests, and especially the various forms of chromocystoscopy, more unreliable still, for he has found them misleading when both positive and negative, and has given them up entirely in favor of the simple quantitative urea estimation by means of the Esbach ureometer.

If one kidney is sound, Rovsing advocates nephrectomy in every instance, as conservative measures, such as tuberculin therapy, only waste time and give the disease a chance to spread. By nephrectomy, 75 per cent. of the patients can be saved, but there is no case on record in which the cure of renal tuberculosis by conservative methods has

been conclusively demonstrated. Even when the bladder is fairly extensively involved, nephrectomy should be performed if one kidney is healthy, for the vesical lesions will undergo spontaneous cure in a certain proportion of cases. If they do not, the bladder should be washed out every other day with sterile water, this being followed by the injection of 50 c.c. of freshly made, warm 6 per cent. carbolic acid solution, which is allowed to remain for two or three minutes. At first this will come away as a milky fluid, but will get clearer and clearer as the process heals up. The treatments should be persevered in, at somewhat increasing intervals, until the fluid comes away perfectly clear each time, and cystoscopic examination shows the tuberculous ulcers to be entirely replaced by smooth, mother-of-pearl-like cicatricial areas. This may take six weeks or more in severe cases, but cure is sure to result, in the author's experience, provided that the source of infection has been removed, and that the tuberculous process in the bladder is limited to the mucous membrane, and has not spread through the walls.

Technique of Nephrectomy for Tuberculous Kidney. W. J. Mayo¹ does not approve of the usual practice of draining the wound after removal of a tuberculous kidney, even if tuberculous material has escaped into the surrounding tissues, because this results in the formation of a sinus which is slow to heal, often becoming contaminated with a mixed infection, and preventing ultimate cure. For the past two years, therefore, he has been following a different plan. After removing the kidney and treating the ureter, he cleanses the wound as well as possible, and then fills the cavity with as much normal salt solution as it will hold—a quart or more, if necessary—and then closes without drainage. He has been much pleased with the results, and believes that the salt solution enables material infected with attenuated tubercle bacilli to be quickly absorbed, before there is an opportunity for the formation of favorable cultural conditions which would increase the virulence of the organisms. In cases in which there has been no soiling of the wound with tuberculous material, no salt solution is employed, the wound being simply closed without drainage. This is, of course, the condition to be aimed at in all cases; to secure it, a sufficiently large incision is essential, and the author has found that illustrated in Fig. 117 to be the best for this purpose. The vertical cut frees the twelfth rib from its posterior attachments, while the long transverse incision mobilizes the lower wall of the thorax, so that even a large kidney may be removed with ease.

With regard to the ureter, Mayo states that for several years he has been following the comparatively simple procedure of injecting 10 to 20 minims of 95 per cent. carbolic acid into its lumen after cutting

¹ *Surgery, Gynecology, and Obstetrics*, 1912, xv, 523.

away the kidney; this fluid becomes distributed throughout the entire length of the ureter, and one thus treated has rarely, in his experience, given further trouble.

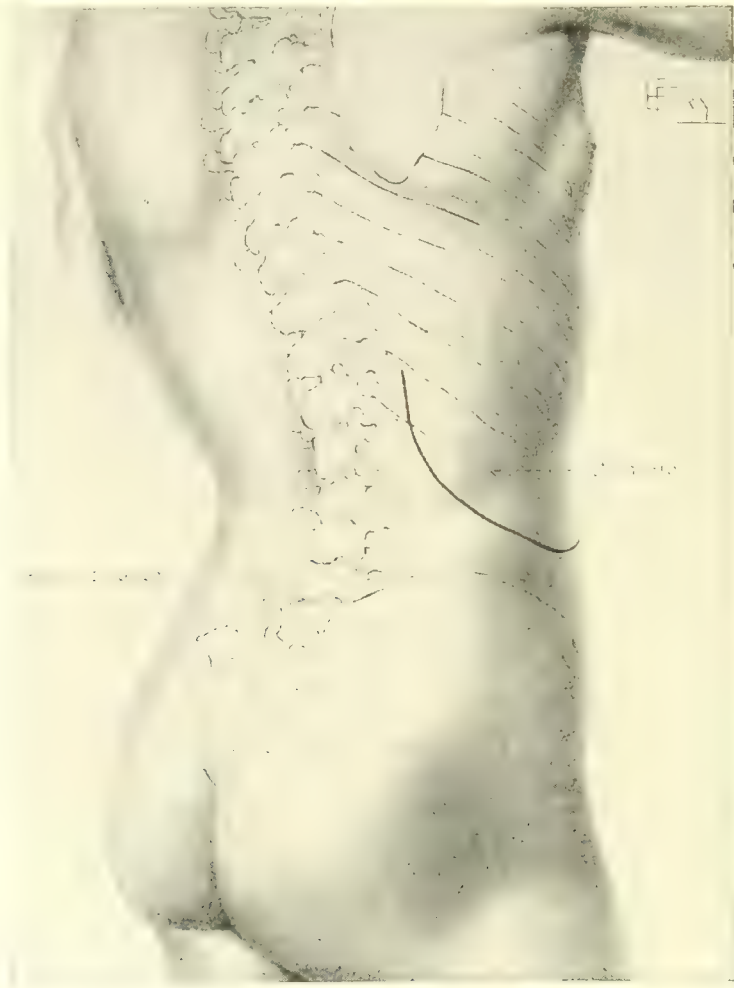


FIG. 117

Polycystic Kidney. In view of the fact that congenital cystic kidney is nearly always a bilateral condition, and that nephrectomy is, therefore, in the vast majority of cases, absolutely contraindicated, a method of treatment advocated by Rovsing¹ appears to be of considerable practical value. He has found multiple puncture of the cysts to be a rational surgical procedure, which often causes improvement in the general health and prolongation of the life of the patient. He reports 3 cases in which he has carried out this treatment, with good results in all.

Case 1 was a man, aged forty-one years, suffering from pain in the left kidney region. At operation the left kidney was found to be 18 cm. long, nodular, and multicystic. The superficial and then the deeper cysts were punctured and evacuated, this procedure reducing the kidney to half its former size, and being accompanied by prac-

¹ American Journal of Urology, 1912, viii, 120.

tically no hemorrhage. The wound was packed with gauze soaked in silver nitrate solution; for three days there was a slight urinous discharge, but this then ceased, and no permanent fistula was formed. The daily amount of urine increased from 1500 c.c. to 2000 c.c.; the patient was entirely relieved of his pain, and lived three years after operation, death being due to uremia following an acute fever.

Case 2 was a woman, aged fifty-five years. The right kidney was palpably enlarged, and the patient complained of pain in this region. At operation, it was found to be a mass of cysts, puncture of which reduced it greatly in size. The wound was treated as in the first instance, and healed equally well. The patient was relieved of all pain, and is apparently well two and one-half years later.

Case 3 was also a woman, aged fifty-two years. She complained of pain in the abdomen, chiefly to the left of the epigastrium and about the umbilicus. At operation, a huge, multicystic left kidney, and a smaller, also cystic right kidney were found. The cysts in the left kidney were punctured as in the other cases; those in the right kidney were let alone, as they were comparatively small in size. In this instance, the wound was closed without drainage. The pain entirely disappeared, and the daily excretion of urine rose from 440 to 1250 c.c.

In all these cases, in addition to disappearance of pain, the renal function was restored to a remarkable degree, as was shown in one instance by diminution in the amount of albumin, and in all by great increase in the urea elimination, as well as by the increase in the amount of urine. Rovsing explains this phenomenon on the ground that normal kidney parenchyma is always present between the cysts, but its action is inhibited by the pressure; when this is relieved, the normal kidney function is reestablished, the patient's general condition showing a corresponding improvement. He does not claim that the operation is in any sense curative, but considers it the best form of palliation at our command.

Treatment of Pyelitis. Hunner¹ states that there are but comparatively few cases of pure catarrhal inflammation of the kidney pelvis unassociated with some mechanical, traumatic, toxic, or chemical predisposing factor. When such a factor is present, successful treatment calls for activities directed elsewhere than to the kidney *per se*. In uncomplicated pyelitis cases, the patient, as a rule, suffers with ill health and discomfort entirely out of proportion to what would be expected from examination of the urine; except in acute cases, there are rarely many bacteria or pus cells, and hence attention is often directed away from the true condition by the urinary examination.

The majority of these cases of *uncomplicated* pyelitis clear up under medicinal and hygienic treatment—rest in bed, free ingestion of fluid,

¹ Surgery, Gynecology, and Obstetrics, 1912, xv, 444.

light but nourishing diet, supplemented by hot applications, or counter-irritation over the kidney region by means of the Paquelin cautery. The use of antiseptics by mouth is considered by the author to be of doubtful value; hexamethylenamine appears to influence urinary infection in only a small percentage of cases, and if positive results from its use are not seen within ten days, it should be stopped. Some estimations of the quantity of formalin demonstrable in the urine of patients taking hexamethylenamine made by the author's colleague, Dr. Burnam, have shown it to be present in sufficient quantity to be of any antiseptic value in only about 2 cases out of every 10.

In those cases which resist medicinal and hygienic treatment, irrigation of the kidney pelvis through the ureteral catheter should be resorted to. For this purpose, Hunner employs chiefly 2 per cent. aluminum acetate solution, 25 per cent. argyrol, or 1 to 1000 silver nitrate; the latter is his favorite, and he usually follows it by a brief flushing with boric acid or salt solution. As a rule, he has found a few irrigations sufficient to render the urine sterile, and not until it is sterile, as well as free from leukocytes, does he consider the patient cured. He introduces the catheter by direct vision through the Kelly air cystoscope, and judges of the amount of fluid to be employed by the patient's sense of fulness or pain in the kidney region, this often reproducing accurately the pain for which she is seeking relief.

Bloodvessels of the Female Bladder. Fromme¹ says that he is convinced that all the thicker vessels which are visible through the cystoscope on the surface of the bladder, as well as all the finer ones which dip down under the mucosa, are veins, and not arteries, as is taught in practically all the text-books on cystoscopy. He has never, even with the most powerful illumination and the highest magnification obtainable, seen any evidence of true pulsation in these vessels, though he has occasionally seen variations in their degree of dilatation when observing them constantly over considerable periods of time, these variations, however, having no relation to the arterial pulse. Moreover, these vessels, when viewed with a sufficiently powerful instrument, can be seen to have a distinctly bluish tinge wherever they dip down slightly beneath the surface of the mucosa. The arteries, according to Fromme, are much finer, and can scarcely be seen unless a condition of hyperemia exists. This can be produced by keeping the cystoscope lamp burning in the bladder for a considerable time, or by running 100 c.c. of a 1 per cent. collargol solution into the empty bladder and allowing it to remain for a few minutes just before beginning the cystoscopic examination. Then, running parallel with the larger veins, will be seen very fine vessels, of even caliber throughout, which the author considers to be the arteries.

¹ Zeitschr. f. Geburtsh. u. Gynäk., 1912, lxxi, 99.

By carefully noting the vascular distribution, as seen in the cystoscope, Fromme thinks that one can often determine at just what portion of the bladder the instrument is pointed, and that locating the ureters may be thereby greatly facilitated. There are two fairly constant veins, or venous plexuses, which arise from the posterolateral aspect of the bladder on each side, and take their course in a general way toward the ureteral orifice, forming thus a lateral continuation of the ligamentum interuretericum. These the author designates as the anterior and posterior veins of the ureteral ostium (Fig. 118). In

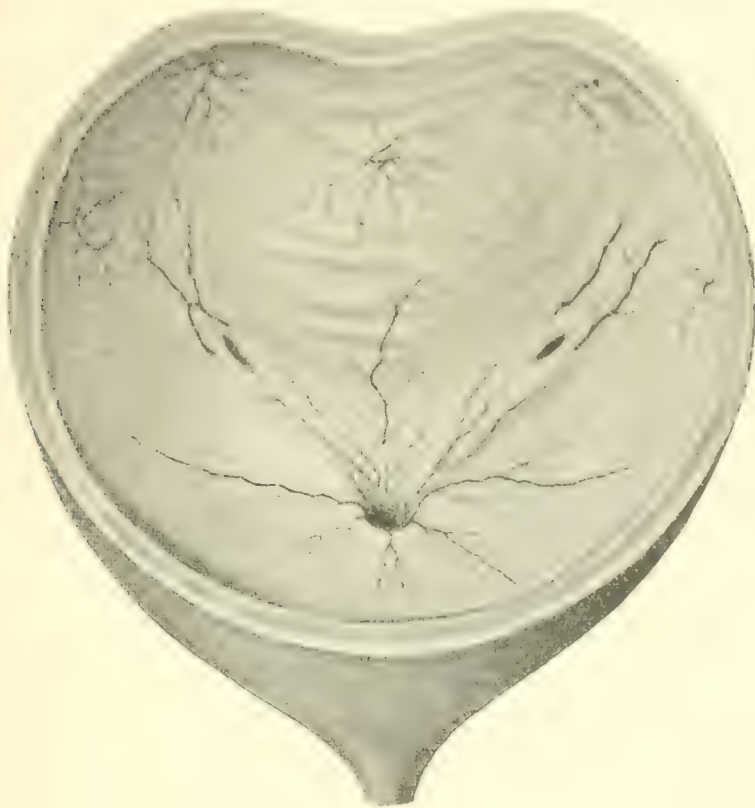


FIG. 118

cases in which the ligamentum interuretericum is poorly developed, or where the ureteral orifices are somewhat hidden, these veins, especially the posterior, are often of great service in locating them, as if one comes upon long, almost parallel veins on the posterolateral aspect of the bladder, it is merely necessary to follow them forward to arrive at the ureteral orifice. Star-shaped, radiating groups of vessels appearing in the field indicate that the cystoscope is pointing toward the posterior, lateral, or superior parts of the bladder wall, whereas long-drawn-out, somewhat converging veins crossing the field indicate the trigone, in proximity to the vesical sphincter.

Treatment of Cystitis. An exceedingly simple treatment for cystitis, which appears to be based on sound principles, is advocated by Farnarier.¹ It consists in the introduction into the empty bladder of

¹ *Semaine Méd.*, 1912, xxxii, 325.

iodine vapor, this being accomplished by means of the apparatus shown in Fig. 119. The glass retort *A* has a capacity of about 30 c.c.; it has a large opening at the top for the introduction of iodoform powder, and a smaller one at each side, one of these being connected with a piston syringe having a graduated barrel, the other with a rubber catheter. The technique is first to irrigate and then empty the bladder, measuring its capacity at the same time. About 5 to 10 cg. of iodoform are then placed in the retort *A*, under which is a small alcohol lamp. As soon as the retort is filled with the violet iodine vapor, the piston of the syringe is pushed down a distance corresponding to the previously determined capacity of the bladder, thus driving over a corresponding amount of vapor through the catheter. It is allowed to act for two to five minutes, according to the amount of discomfort produced; the apparatus is then disconnected, and the vapor passes off through the catheter.

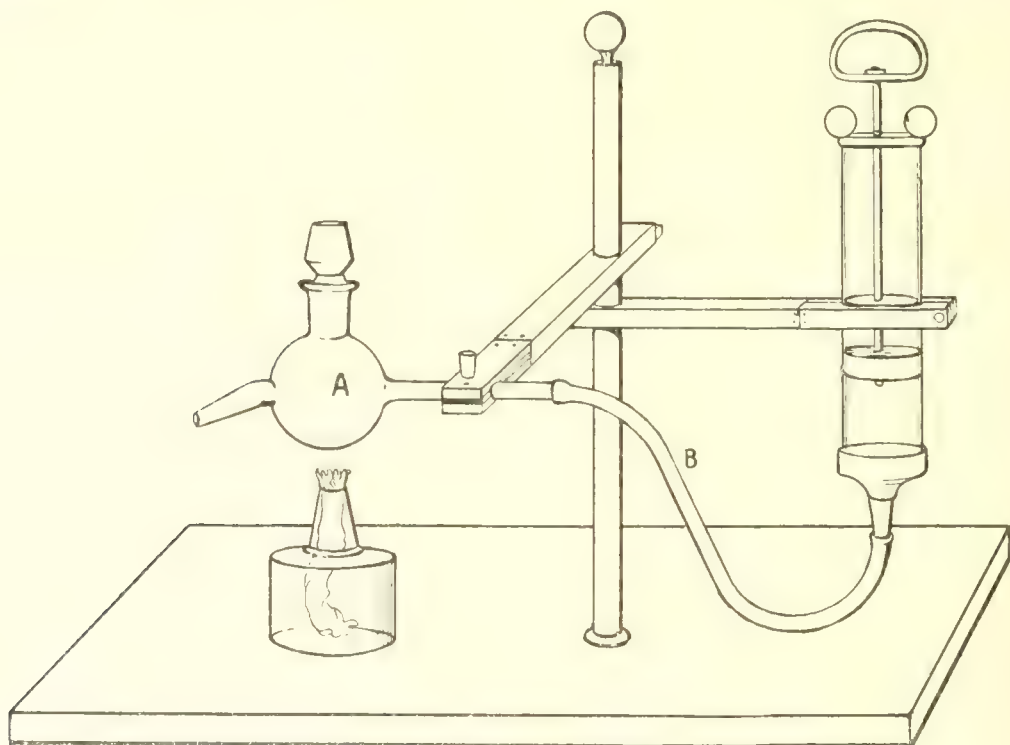


FIG. 119

Of the 17 patients upon whom the author has tried this treatment, only 1 complained of any considerable pain. Two of the cases are cured, the others were at the time of writing still under treatment, but all showed much improvement. That this treatment may at times be more efficacious than the ordinary irrigation with silver nitrate was shown by one of the patients, a young woman with a severe cystitis secondary to renal tuberculosis. She had been treated for one and one-half years by all the other methods in general use, without any benefit, but has shown such marked and rapid improvement under the iodine treatment that cystoscopic examination, which was formerly

out of the question, has now become possible, thus greatly facilitating the diagnosis of the fundamental lesion.

Treatment of Incontinence. What appears to be a rational treatment for obstinate cases of incontinentia urinae in women, due to loss of tone by the internal vesical sphincter, is suggested by Caspar.¹ This consists in burning two or three deep scars across the sphincter muscle at the point of transit from bladder to urethra, the idea being that this will be followed by sufficient cicatricial contraction of the sphincter apparatus to restore its efficiency. The procedure is not a serious one; it is carried out by means of the author's operating cystoscope, and is not at all difficult of performance. Caspar reports having treated successfully by this method 2 cases of incontinence and 1 of enuresis nocturna, the latter in a girl aged sixteen years. In all these patients, numerous other methods of treatment had been given a thorough trial, but without success.

Urethroscopy. Garceau² has made an important modification in the original form of the female urethroscope as devised by Skene, which consisted of a glass tube of very small caliber (20 Fr.), and a small mirror mounted on a shaft, sliding back and forth in the tube (Fig. 120).

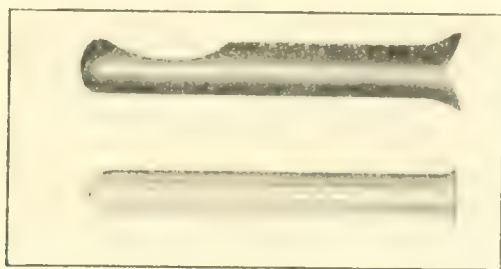


FIG. 120

Illumination was secured by reflected light from a head mirror, but the instrument was always unsatisfactory, as sufficient light could not be thrown into the tube on account of its small size, and the pictures seen through it were dark and indistinct.

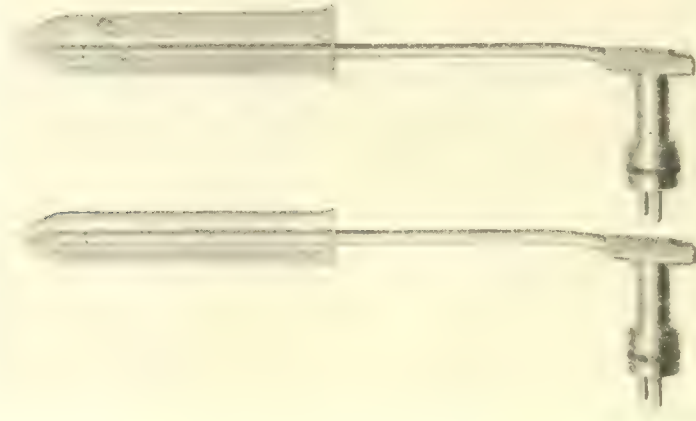
By making the ends of the tube distinctly conical, Garceau has been able to increase the caliber up to 30 or 36 Fr., and by introducing a small electric light on the end of a shaft, on the principle of the ordinary proctoscope, much better illumination has been secured (Figs. 121 and 122). A small mirror may also be mounted on the shaft, as in the original Skene instrument, but owing to the increased caliber of the tube, this is necessary only for viewing the deepest portions of the urethra.

Garceau has found that these large tubes may usually be introduced without local anesthesia, though some preliminary dilatation of the

¹ Zeitschr. f. Urologie, 1912, II Beiheft, 238.

² Surgery, Gynecology, and Obstetrics, 1912, xiv, 80.

meatus may at times be necessary. The pressure of the tube does not obliterate areas of congestion in the urethral mucosa, as the author had at first feared, but these stand out plainly, and appear to be unaffected by the instrument. For the treatment of lesions requiring local applications, Garceau employs his modification of the Ives specu-



FIGS. 121 and 122

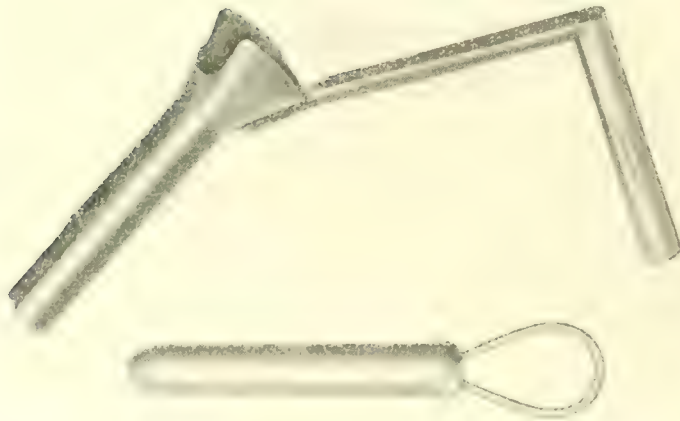


FIG. 123

lum, which is simply a short tube, with a notch cut in the distal end (Fig. 123). It is introduced with an obdurator, and turned until the notch is over the diseased area, previously located with the urethro-scope. The obdurator is then removed, and direct applications are easily made.

THE VULVA, VAGINA, AND RECTUM

Carcinoma of the Vulva. It has probably been the experience of most surgeons that the results of operation for carcinoma of the vulva are

bad, recurrence taking place comparatively early in the majority of cases. Stoeckel¹ believes that this is in part due to the poor general condition, advanced age, etc., of many of these patients, so that, as a rule, surgeons hesitate to attempt very extensive operations upon them. With the substitution of spinal for general anesthesia, however, and the adoption routinely of an operation comparable in its radicalism to that of Wertheim for carcinoma of the cervix, he believes that a much larger percentage of these patients may be cured than has been the case in the past.

In Stoeckel's experience, recurrence takes place either in the vulvovaginal scar, in the inguinal region, or in the iliac and hypogastric glands. The recurrences in the scar are due to too scanty circumcision of the original growth, or to implantation-metastasis. To avoid the latter, thorough curettage and cauterization of the tumor should be the first step in the operation. The inguinal glands are to be removed not singly, but in a mass with the entire connective tissue containing the lymphatic channels, this being best accomplished by means of two long, oblique incisions, beginning at each anterior superior spine, and meeting at an angle at the mons veneris. In removing this tissue, it must be remembered that lymphatic glands lie not only in the line of incision, but also extend downward along the vessels of the thigh, and upward along the round ligament, many recurrences being undoubtedly due to incomplete extirpation of the lymphatic tissue in these areas. The triangle between the sartorius should therefore be thoroughly cleaned out down to the fascia and vessels, ligating, if necessary, the external pudic and superficial circumflex iliac arteries.

In addition to the glands in the inguinal canal, those still more centrally situated—the iliac and hypogastric—are especially liable to invasion. Although these can be reached extraperitoneally by a pararectal incision, Stoeckel prefers a median incision and transperitoneal approach, as this permits of a better view and more thorough extirpation. He believes that, in every case of vulvar carcinoma in which there is the slightest chance for recovery, every possible gland should be removed.

Having removed the pelvic glands by laparotomy, and the inguinal glands by the two oblique incisions, his next step is to make a vertical incision from the mons veneris downward, passing around the vulva, and then to shell out the entire vulvovaginal tissue, keeping close to the anterior surface of the symphysis and the internal edge of the pubic arch. Only after completely freeing the vagina from the urethra, from the pubic bone, and from the rectum, is the tumor-mass finally cut away. All wounds should be closed with fairly free drainage, and a retention catheter placed in the bladder.

¹ Zentralbl. f. Gyn., 1912., xxxvi, 1102.

Lymphatics of the Clitoris. A possible explanation of the extreme malignancy of some of these cases of vulvar carcinoma, especially of those starting in the clitoris, is furnished by Rouvière,¹ as the result of some anatomical studies of the lymphatics of this region. By injection methods, he has been able to demonstrate in a few instances the presence of lymph vessels which establish a *direct* connection between the clitoris and the hypogastric glands in the small pelvis, a finding quite analogous to that reported by Küttner with regard to the penis. These findings are contradictory to the classical descriptions of the lymph supply of the clitoris, according to which the occurrence of metastases in the small pelvis, without involvement of the inguinal and retrocrural glands, is very difficult to explain; the occasional occurrence of this direct lymphatic path does explain these cases, the author thinks, and therefore has considerable bearing on the surgical aspect of the subject.

Formation of Artificial Vagina. Of all the methods that have been devised for the formation of an artificial vagina, that reported by Dreyfus² is probably unique. His patient was a girl, aged twenty-two years, who had never menstruated, but who had slight menses each month. On examination, the vagina was found to be completely lacking, but there was a large mass palpable in the abdomen, reaching to the umbilicus. The operation consisted in opening up the urethro-vesicorectal septum by blunt dissection until the large mass was reached; this was then punctured with a trocar, permitting the escape of a large quantity of bloody fluid, but no attempt was made to join the newly formed vaginal canal to this mass, which probably represented the much dilated uterus. The opening made in the vesicorectal septum was tightly packed with gauze, and the patient returned to the ward.

Two days later, Dreyfus operated on a healthy man for a large inguinal hernia. The sac, which had been opened only at the base, and was, therefore, intact, was placed immediately in warm salt solution; at the conclusion of the operation it was filled with vaselined gauze, all fat and cellular tissue were removed from the external surface, and it was then introduced into the recently formed artificial vagina of the young woman. The edges of the hernial sac were trimmed off 0.5 cm. from the vulvar edge; no sutures were used to hold it in place, but the patient's thighs were strapped together and the bowels kept locked for eight days. A slight amount of suppuration occurred, but the graft took well, and the patient was discharged with apparently an almost normal vagina. Sixteen months later it showed no signs of contraction, being 7.5 cm. in depth, not in the least tender, and easily admitting two fingers, notwithstanding the fact that no

¹ Annales de Gyn. et d'Obst., 1912, xxxix, 273.

² La Gynécologie, 1912, xvi, 206.

dilatations had been performed after the patient left the hospital, nor had coitus taken place.

Prolapse of the Rectum. According to Heile,¹ the underlying causes of this condition have been definitely shown to be a relaxation of the pelvic floor, and an enlargement of the pouch of Douglas, which latter acts as a wedge, pressing ever deeper into the supporting tissue of the pelvis. Since the peritoneal pouch is firmly attached to the rectum it causes that organ to be carried downward also. In advanced cases, measures directed merely toward strengthening the pelvic floor are not sufficient to prevent recurrence, and attempts have therefore been made to supplement this by various suspension methods. In women especially the levator fibers are often so stretched and atrophic that it is impossible by ordinary plastic work alone to construct a perineum which will hold, and even if Douglas' pouch is partially obliterated by attaching the uterus to the anterior abdominal wall, a wedge-shaped space is left behind the uterus in which intra-abdominal pressure can act. Heile has therefore attempted to create throughout the breadth of the pelvis a firm roof, reaching from the rectum to the symphysis, to serve as a firm support for all that portion lying anterior to the rectum.

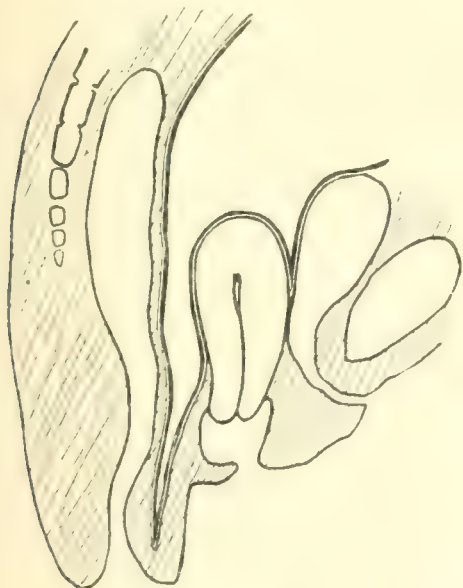


FIG. 124

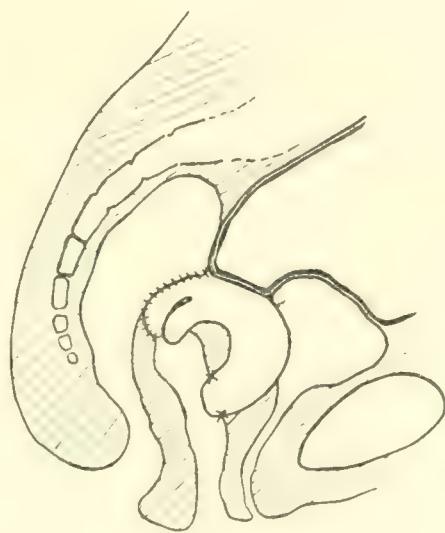


FIG. 125

The first step in his operation is to open Douglas' pouch through the posterior vaginal vault, and then to attach the cervix to the anterior rectal wall, after having dissected up the peritoneum to a sufficient height. Next, the anterior vaginal wall is opened, and the fundus uteri brought out under the bladder, as in the Schauta-Wertheim-Watkins operation, and sutured there. The operation is completed

¹ Deutsch. med. Woch., 1912, xxxviii, 601.

by an anterior and posterior colporrhaphy. The uterus now lies immediately against the pelvic floor, Douglas' pouch is obliterated, and the cervix, being firmly fastened to the rectum, is made an important support in closing the hernial orifice. The conditions present before and after the operation are shown diagrammatically in Figs. 124 and 125 respectively.

Carcinoma of the Rectum; Excision through the Vagina. The numerous advantages of the vaginal route in attacking carcinoma of the rectum are strongly urged by Chalié and Perrin.¹ One of the most important of these is that while the vaginal operation can be carried out in an entirely aseptic manner, and permits of as wide a resection as any other, it preserves the sphincteric function, and does not produce as much shock as those methods which involve a resection of a portion of the pelvic skeleton. The operation finds its particular indication in cases of limited, non-adherent tumors, whose lower limit is at least 4 to 5 cm. above the anus, and whose upper limit does not extend above the upper end of the rectum (third sacral vertebra). In a few instances, however, even sigmoidal tumors have been successfully resected through the vagina. The chief local contra-indications, which may occasionally be present, are vaginal malformations, inflammatory conditions of the genitalia, and marked decrease in the transverse diameter of the pelvic outlet, such as is found in rachitic pelves.

TECHNIQUE. The patient undergoes, if possible, a preliminary treatment for one or two weeks; during the first part of this time she is purged, but the bowels are kept locked for the last day or two preceding operation. In very advanced cases, when much difficulty is to be expected, or when the patient is in serious condition from partial obstruction, it may be well to establish an artificial anus at a previous sitting; ordinarily, however, this is not done. With the patient in the lithotomy posture, a transverse incision is made behind the cervix, thus opening the peritoneal cavity as in the ordinary posterior colporrhaphy (Fig. 126), the tumor is explored through this opening, to determine its extent, operability, etc. A gauze pack is then temporarily inserted to protect the peritoneum against the entrance of blood, and to prevent the escape of a loop of intestine.

From the centre of the transverse incision, a longitudinal one is now carried downward, swinging to the left of the median line, passing at first through the vaginal wall only, then being continued across the perineum to the left of the anus as a typical Schuchardt paravaginal incision. The anterior surface of the rectum being thus exposed, its liberation is carefully begun with the scissors in front, with the fingers laterally and posteriorly (Fig. 125); when completed, a strip of gauze is passed around the liberated portion.

¹ Rev. de Gyn., 1912, xix, 101.

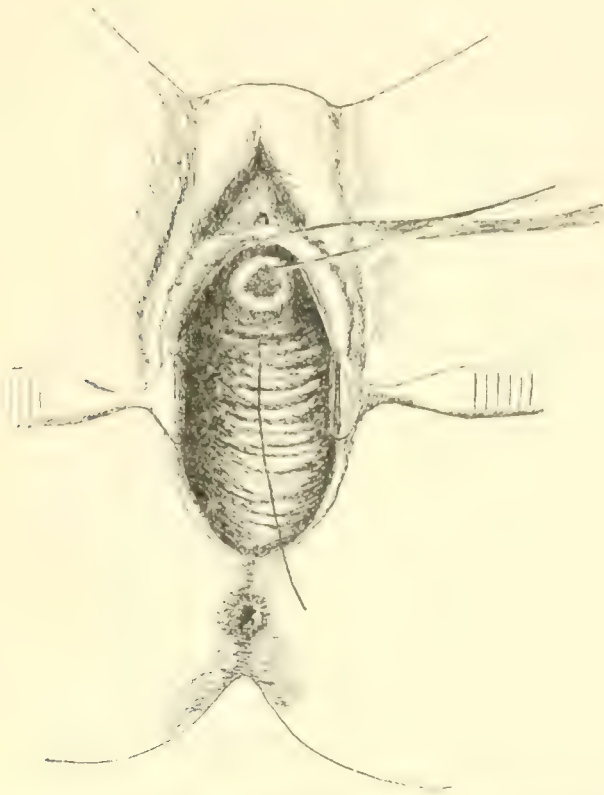


FIG. 126.—Line of T-incision; the transverse arm is the ordinary colporrhaphy incision; the vertical arm, running obliquely to the left, passes first through the vaginal wall, then the fourchette, and is prolonged over the perineum and lateral aspect of the anus.

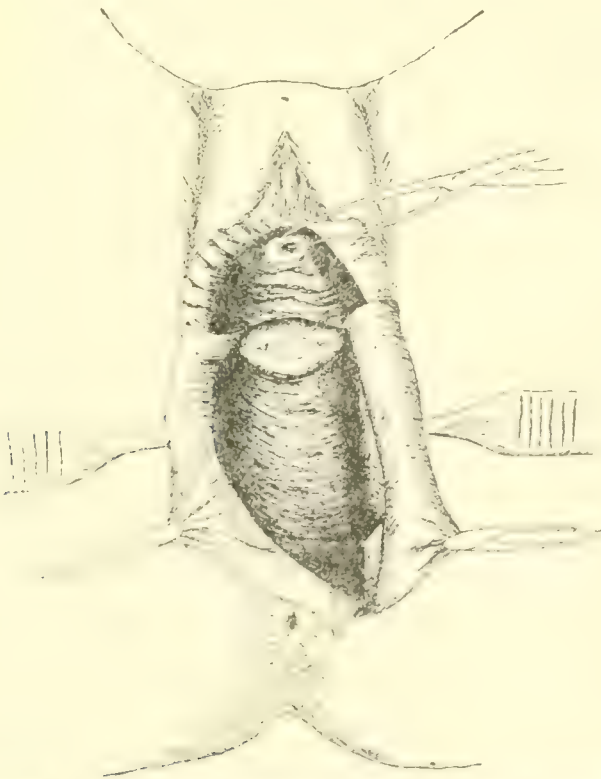


FIG. 127.—Opening of Douglas' pouch and liberation of rectum after separating the two lips of the posterior vaginal wall.

The lateral attachments of the cul-de-sac are now cut between ligatures, and the mesosigmoid is freed from its sacral attachments up to the level of the promontory, permitting the sigmoid to be drawn down (Fig. 128). The bowel having been thus mobilized to a point well above the upper limits of the tumor, the peritoneal cavity is closed; for this purpose, the gauze strip is removed from Douglas' pouch, and the anterior edge of the peritoneum is fastened by a few interrupted catgut sutures to the serosa of the anterior surface of the pulled-down sigmoid at a point as far as possible above where the resection is to be made. These sutures are carried well out to each side, so as to completely close the peritoneum of Douglas' pouch.

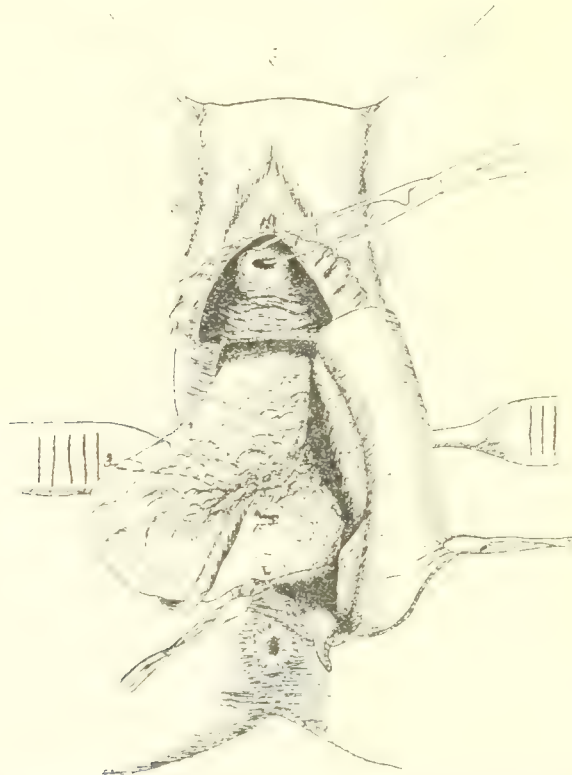


FIG. 128.—The mobilized sigmoid flexure brought out through the vaginoperineal opening. The dotted lines *a* and *b* indicate the lines of resection.

The tumor-bearing area of the gut may now be resected, beginning preferably at the upper end, at least 2 or 3 cm. above the upper edge of the growth. Catching and tying the vessels in the mesosigmoid as the resection proceeds, this is carried down to a similar distance below the edge of the tumor. The next step is to excise all the mucosa from the bit of rectum left attached to the anus below the point of resection. This may be facilitated by evaginating this portion of the gut; after removal of the mucosa and reduction of the eversion, the lower edge of the upper segment is caught with forceps, introduced through the anus, and drawn down through the lower segment until it appears at the sphincter (Fig. 129). The temporary ligature which was placed around this portion of the

bowel prior to resection is now removed, and its mucosa sutured carefully to the peri-anal skin; the upper end of the lower segment

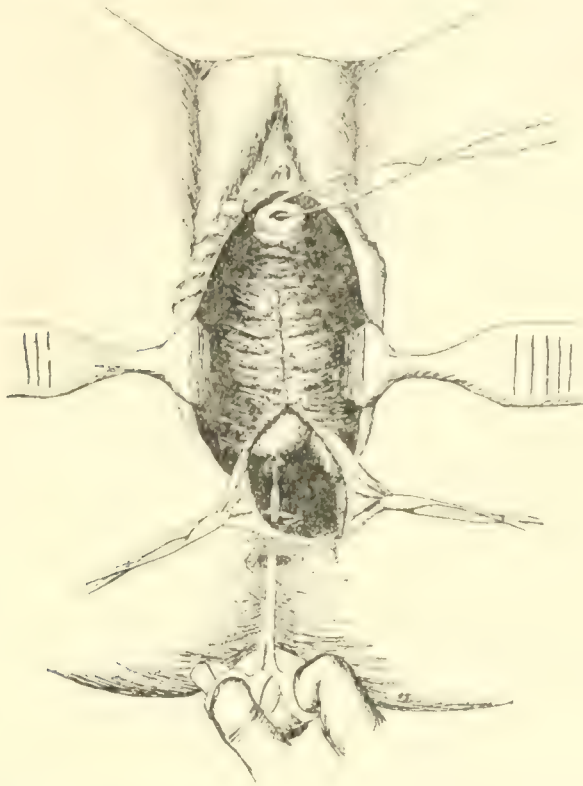


FIG. 129.—The upper segment is drawn down through the lower segment to the anus.

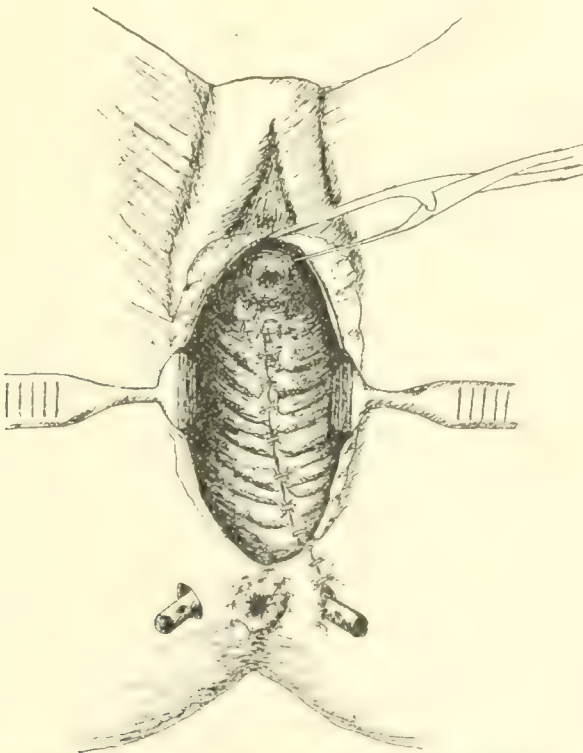


FIG. 130.—The operation is completed; the upper segment, invaginated through the lower, is sutured to the skin of the anus; the vaginal and perineal incisions are closed with interrupted sutures; drainage of the two ischiorectal fossæ.

may also be fastened by a few sutures to the wall of the upper segment, and the latter to the neighboring portions of the levator muscle. The operation is terminated by closing the vaginal wall, after introducing a small drainage-tube into each ischiorectal fossa, permitting these to emerge through lateral punctures, and placing a small drain in the lower angle of the wound (Fig. 130).

The authors believe in keeping the bowels locked for eight to ten days after operation. The chief postoperative complications to be feared are fistulas and stenoses. The former are to be treated by suitable plastic operations, the latter by dilatation with Hegar's bougies. The authors insist that their free opening of the peritoneum is preferable to the practice of some surgeons of dissecting it up, without opening it, as the latter procedure does not afford the opportunity of satisfactorily examining the mesosigmoid, often the site of carcinomatous lymph glands, nor of obtaining good mobilization of the intestine. By closing the peritoneum again before cutting through the intestinal wall, they claim that all danger of infection is avoided.

Some surgeons advocate uniting the two ends of the resected intestine by a circular suture, instead of by invagination, but this is to be condemned, as it is almost invariably followed by partial or complete separation, owing to poor nutrition of the tissues, and although invagination is not entirely exempt from this danger, it appears to be the more reliable method of the two. One of the most important points in the entire operation is the control of hemorrhage; liberation of the rectum, if carefully carried out along the line of cleavage, is not accompanied by severe bleeding, and its mobilization in this manner permits of ligating all the larger vessels before cutting them. It is especially important, also, to prevent gangrene of the upper segment; the best way to accomplish this is to ligate the superior hemorrhoidal artery *above* the point where the anastomotic sigmoidorectal artery is given off, this being usually at the level of the sacral promontory. If the ligature is placed below this point, gangrene is very apt to occur.

MISCELLANEOUS TOPICS

Treatment of Sterility in Women. THE WYLIE DRAIN. Norris¹ reports the results obtained in the Gynecological Clinic of the University of Pennsylvania during the past four years in the treatment of sterility in women in whom no cause for the condition could be found other than a certain degree of obstruction to the cervical canal. He believes that the prognosis is best when dysmenorrhea of the obstructive type is associated with the sterility, as it is in these patients that the stenosis of the cervical canal is most apt to be the true cause.

¹ Surgery, Gynecology, and Obstetrics, 1912, xv, 706.

The method of treatment employed has been the thorough, *slow* dilatation of the cervix under ether to a degree considerably greater than that required for ordinary curettage, at least fifteen minutes being taken for this. After the cervix is completely dilated, the cavity of the uterus is explored for the possible presence of a polyp or small submucous myoma, but is not routinely curetted. This is followed by the insertion of the author's modification of the Wylie drain (Fig. 131). This is a stem pessary, having a good-sized groove on each surface, and a well-marked bulb on the inner end. The drain selected should be of such size as to reach to within 1.5 cm. of the end of the endometrial cavity; it is secured in place by a couple of silk sutures, which pass through the little hole in each arm of the drain and catch a bit of cervical tissue. The vagina is then lightly packed with gauze, which is removed at the end of twenty-four hours. The drain is left in the uterus for six weeks, during which time the patient should remain under observation. As long as it is in place, complete baths and douches of any sort are forbidden, but marital relations may be resumed within seven days after the operation, the patient remaining with the hips elevated on a hard pillow for some time after each coitus to prevent the escape of seminal fluid from the vagina.

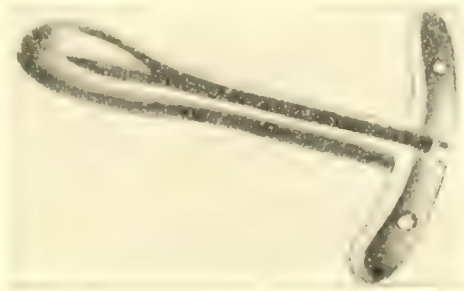


FIG. 131

The advantages of a stem pessary of this type are that it produces permanent dilatation and free drainage of the cervical canal, and that it excites uterine contractions, which tend to develop small, hypoplastic uteri, so often the cause of dysmenorrhea and sterility. The theoretical objections to this form of treatment which have been advanced are that there is danger of infection, with consequent endometritis, and that the pessary, despite the grooves on its shaft, may act as a plug and not as a drain. Practical experience has shown, however, that these fears are ungrounded if proper care be taken in the selection of cases. Every patient should be most carefully examined, preferably under ether, and none in which there is the slightest evidence of gonorrhea, or of chronic adnexal disease, should be subjected to this form of treatment. Neglect of this point is probably responsible for the majority of infections which have been reported as following the use of the stem pessary; that this can be absolutely avoided is shown by the fact

that during its extensive use for dysmenorrhea and sterility in the gynecological clinic at the University of Pennsylvania during the past four years, not a single postoperative infection has occurred. It must be remembered, however, that the routine practice of subjecting *all* cases of sterility to some form of dilatation, without proper examination or diagnosis, cannot be too strongly condemned.

The results obtained from this treatment have been quite encouraging. Of 35 cases whose subsequent histories it has been possible to obtain, 13 conceived, 3 of them presumably while the drain was still in the uterus. This gives a cure of the sterility in 37 per cent., but as in many of the earlier cases the fecundity of the husband was not demonstrated, and several of the cases classed among the failures have been operated upon less than a year, the actual percentage of cure will probably be found ultimately to average somewhat higher.

SALPINGOSTOMY. McCann¹ believes that the operation of salpingostomy has a larger field of usefulness than is usually assigned to it in the treatment of sterility due to old gonorrheal infections with closed tubes, and thinks that very satisfactory results can be secured if the cases are properly selected and the operation correctly performed. He reports 1 case of tubal pregnancy, and 2 normal gestations, both of which went to term, following salpingostomies; in one patient, conception did not occur until two years after the operation, showing that patency of the tubes may be maintained for at least that length of time.

There are a few points in the technique which the author considers of importance. The tube should be opened along the upper border, and not cut off at the end, as the latter procedure is much more apt to be followed by contraction and closure of the opening, whereas a free incision along the upper edge has the advantage that the contraction of the circular muscle fibers in the tube wall will tend to maintain its patency. Very fine catgut should be used to join the mucosa to the peritoneal coat, and the utmost gentleness must be used in all manipulations. Any adhesions present should be cut, and not torn. It is well to employ a fairly large abdominal incision, so as to have the entire field of operation well exposed to view. An extremely important point, in McCann's estimation, is always to suspend the uterus at the conclusion of the operation, so as to prevent the recurrence of adhesions about the tube.

Local Anesthesia in Gynecology. What he terms *nerve-tract anesthesia* (*Leitungsanästhesie*) is much lauded by Ruge² for the performance of all the major vaginal operations, including hysterectomy for cancer. He has found it just as satisfactory as spinal anesthesia, but far less dangerous, and it is, of course, much better than mere local infiltra-

¹ Lancet, 1912, i, 221.

² Zentralbl. f. Gyn., 1912, xxxvi, 561.

tion, as it does not cause any alteration in the appearance and consistency of the tissue in which the operation is to be performed, being applied to the nerve trunks at a considerable distance from the operative field.

His method is first to disinfect the vagina, and then to introduce a long, thin needle, in an oblique direction, into the parametric tissue to one side of the cervix, to a depth of 4 or 5 cm. If the needle is given the proper lateral inclination, the nerve trunks will be caught before they have undergone their ultimate subdivisions, and if it is introduced slowly most of the vessels, and any coils of intestine with which it may come in contact, will be pushed aside and not punctured. In the rare instances in which a vein is injured, blood will at once begin to flow out of the needle, which should then be withdrawn a little and reintroduced in a slightly different direction. Having gotten the needle properly in place, a syringe is attached, and 3 to 5 c.c. of a 1 per cent. novocain solution, containing 5 drops of 1 to 1000 adrenalin to each 100 c.c., are injected, the needle being gradually withdrawn as the fluid is forced in. Similar injections are then made on the opposite side of the cervix, at two points in the anterior, and at two points in the posterior vaginal vault, in the latter situation the needle being introduced merely through the mucosa. As a rule, Ruge has not had to use over 40 c.c. of solution in all, but he considers it practically non-toxic, and believes that much larger amounts could be used with impunity.

In connection with this method of anesthetizing the deeper tissues, Ruge uses cycloform powder in the vagina, thereby obtaining a satisfactory anesthesia of it as well. It is necessary to wait for about half an hour before beginning the operation; the anesthesia then lasts for one and one-half to two hours. The author says that he has found this method very reliable, and reports 2 cases of hysterectomy operated upon under it alone; neither patient felt anything during the entire operation, not even the introduction of large wet pads to hold back the intestines, nor seizing the peritoneum with toothed forceps.

Bacteriological Findings during Operation. Bauereisen¹ thinks that it is a good thing for the surgeon occasionally to check up the efficiency of his aseptic technique by having systematic cultures made from time to time during the course of all operations. He reports the results of investigations of this character which he has carried out in a series of 254 laparotomies and 86 other operations in the gynecological clinic at Kiel. His method was to swab small sponges over the operative field, both before and during operation, and then to inoculate bouillon from these, later transplanting to aerobic and anaërobic blood-agar plates. In his 254 laparotomies, he found the skin wound sterile only

¹ Zentralbl. f. Gyn., 1912, xxxvi, 386.

30 times, the most frequently occurring organisms being pyogenic staphylococci, air staphylococci, streptococci, sarcinæ, and representatives of the potato and hay-bacillus groups in this order. The peritoneum was found less frequently infected, being free 80 times; in cancer patients, however, organisms were almost always present, sterile cultures being obtained from but 2 out of 43 such cases. In 42 vaginal hysterectomies, the peritoneum was found sterile 11 times.

From these investigations, Bauereisen concludes that "endogenous" organisms are very commonly present, but that they play an important role in the postoperative course only in association with carcinoma and adnexal inflammations, but more particularly the former. In malignant disease, organisms can remain virulent for a longer time, owing to the good cultural conditions furnished by the large area of poorly resisting tissue left after radical operations. Unfortunately, he has not found any means of establishing a definite prognosis in any specific case on the basis of the organisms cultured from it, as bacteriological methods have not yet arrived at the point of perfection which would permit of distinguishing with certainty between virulent and non-virulent organisms, nor of estimating the patient's resistance. He believes, however, that with careful technique, and protection of the skin wound, healing *per primam* can be secured in most instances, even where, as in carcinoma, a large number of organisms are present.

Blood Pressure as a Factor in Operative Prognosis. Notwithstanding the fact that the relationship between blood pressure and the physiological condition of the heart and bloodvessels is still far from being thoroughly understood, Gross¹ remarks that clinical observation has shown in many instances the value of blood-pressure findings in surgical prognosis. He has made blood counts and blood-pressure estimations before operation on about 200 patients from Klein's gynecological clinic in Munich, and believes that from these certain prognostic indications of value can be obtained. He uses the Recklinghausen modification of the Riva-Rocci instrument, and has tried both the palpatory and auscultatory methods of reading, concluding that it is immaterial which of these one uses routinely, provided that it is always the same, the results of one method not always being absolutely identical with those of the other.

Gross believes that not from the absolute value of any one factor, but from a comparison of various factors, are conclusions to be drawn. Thus of much greater importance than either the actual systolic or diastolic pressure alone is the "pulse pressure" or amplitude, *i. e.*, the *difference* between the systolic and diastolic readings. In cases in which both systolic and diastolic pressures are below the normal, beginning cardiac insufficiency is usually present; increase of both

¹ Hegar's Beitr. z. Geb. u. Gyn., 1912, xvii, 317.

readings means an increased amount of work being thrown on the heart, which is therefore liable to give out easily (guarded prognosis); high systolic, with low diastolic pressure—*i. e.*, great amplitude—indicates still greater obstacles to circulation than does mere hypertonia; the heart can keep up these great pressure variations only by markedly increased activity (bad prognosis).

The author reports a number of operative cases with fatal termination, due in most instances to heart insufficiency, or what Klein terms "secondary anesthesia death," in all of which a high amplitude was present, associated usually with an absolute increase of pressure, and with some anemia. He considers, therefore, that when this combination of conditions is present, operation should be resorted to only for some *indicatio vitalis*, conservative therapy being employed in all other cases.

While many of Gross' deductions may be substantially correct, and although he seems to be on the track of a line of investigation that may lead to results of considerable practical value, his article is unfortunately marred by numerous apparent contradictions, arithmetical mistakes, and typographical errors, which detract considerably from the force of his conclusions, and make his real meaning at times exceedingly difficult to determine.

Chronic Metritis. A rather heroic form of treatment for chronic metritis, which has been in use for some years in the clinic of Prof. Delbet, is reported by Mocquot and Mock.¹ This consists in the injection into the uterine cavity of a 30 to 40 per cent. solution of zinc chloride; for this purpose, a Braun syringe is used, with a cannula of small caliber, so that the solution can flow back around it easily. The cannula is supplied only with small lateral openings near the tip. The injections are somewhat painful, therefore the endometrium is first anesthetized with a 5 per cent. solution of cocaine or novocain, then 1 to 2 c.c. of the zinc chloride solution are injected, the syringe being gradually withdrawn as the injection is given. Before inserting the cannula into the uterus, a tampon should be placed in the posterior cul-de-sac to prevent the solution from coming in contact with the vaginal mucosa; afterward the vagina is washed out, and the patient kept in bed for several hours. A second treatment is not given until the slough resulting from the first one has been cast off, this usually requiring about six or seven days. Several injections are usually necessary to complete the cure. Occasionally very severe pain, accompanied by vomiting and syncope, come on a short time after the injection, and may last as long as twenty-four hours. The authors are convinced that this condition does not signify a leakage of the solution through the tubes into the abdominal cavity, believing this to be

¹ Rev. de Chir., 1912, xxxii, 779.

impossible in view of the very small quantity of fluid used, and the absence of all pressure, but they consider these attacks to be true colics, due to contraction of the uterine muscles; relief may be given in some cases by the use of hot abdominal compresses, but morphine is often required. In no instance has atresia of the cervix or any other serious result followed, although the authors state that this form of treatment is used in Delbet's clinic almost daily; in 3 women, pregnancy has occurred after the termination of a course of injections, showing that the endometrium and uterine walls had been restored to at least functional integrity. The treatment is indicated in practically all forms of metritis except those accompanied by salpingitis, but the best results from it are generally seen in hemorrhagic metritis, and in that following abortion.

Relative Value of Different Douches. The rather interesting fact that the value of any substance used for vaginal douching is dependent far more upon its desiccating and hardening action than upon any bactericidal properties it may possess has been brought out in some recent investigations by Polano.¹ Realizing that the vaginal douche is one of the commonest of all therapeutic measures employed in gynecology, but that our knowledge of the action of the substances commonly employed in its make-up is almost entirely empirical, Polano undertook a more or less systematic investigation of about a dozen such materials, testing each one with an average of 3 patients, some of whom presented symptoms of vaginitis, in others the vagina being apparently normal. The method of carrying out the investigation was to introduce a trivalve speculum into the vagina, and to take a platinum loopful of secretion from each side of the introitus and from each vaginal vault; from these smears were made. Four other similar loopfuls were taken, inoculated on agar, and poured into Petri dishes. After removing the speculum, a douche was given, consisting of 1 liter of fluid containing the substance to be tested. The entire procedure was repeated on three successive days, the bacterial content of the smears and cultures at the beginning and during the course of treatment furnishing the criterion as to the efficiency of the douche.

While no permanent change in the chemical reaction of the vaginal secretion, nor alteration in the *character* of the bacterial flora, was produced by any of the substances tested, a reduction in the number of organisms present, and in their virulence, was noted after the use of some of them. Most efficient in this regard were alum, alcohol, silver nitrate, and bolus alba. Less efficacious, but still of some value, were lysoform and iodine, while pyroligneous acid, lysol, and lactic acid were almost worthless. Of course, the examinations which form the basis for this report are by no means above criticism; to be conclu-

¹ Zeitschr. f. Geburtsh. u. Gynäk., 1912, lxx, 394.

sive they should have been carried out over a much longer period of time, and with a larger number of patients; the results, nevertheless, probably give a fair estimate of the relative worth of the more commonly used substances in the treatment of mild inflammatory conditions in and about the vagina.

Treatment of Climacteric Neuroses. Jung¹ says that it does not do to tell women suffering with characteristic postclimacteric symptoms that their troubles are only imaginary and will disappear with time, for much can be accomplished for their alleviation, even if the therapeutic measures at our command are but symptomatic. The subjective symptoms in patients of this class are due chiefly to vasomotor disturbances; an important indication, therefore, is to have them avoid everything which tends to increase blood pressure. Alcohol should be strictly forbidden, also coffee in most instances; weak tea and cocoa may be allowed. The diet should be as non-irritating as possible, meat being permitted only in very limited amounts. Regulation of the bowels is, of course, of the greatest importance, but should be accomplished by outdoor exercise, with occasional enemas or mild aperient waters, rather than by the routine use of purgatives. Hydrotherapy is often of value; narcotics are to be avoided as a general thing. To combat increase of fat, open-air exercise, and limitation of the calory content of the diet are our chief weapons; thyroid preparations are to be used, if at all, only with great caution, and under constant supervision. Ovarian therapy has not proved of value in Jung's hands.

Gynecological Disease in the Insane. In view of the exceedingly prominent role which certain foreign writers, notably Bossi and his followers, consider gynecological lesions to play as factors in the production of mental disease, some investigations carried out by Taussig² in the St. Louis City Sanitarium are of interest. He examined gynecologically 537 patients suffering from various forms of mental disease, and found in almost half of them some pelvic lesion sufficient to cause symptoms, all insignificant abnormalities being disregarded. From this examination, gynecological disease would appear to be slightly more prevalent among insane women as a whole than among those of normal mentality; the interesting point brought out, however, is the great variation in the frequency of gynecological lesions among the different types of insanity. Of patients suffering from senile dementia, terminal dementia, and paranoia, only about 33 per cent. showed any gynecological abnormality; dementia præcox, 50 per cent.; manic-depressive insanity, 74 per cent. The types of gynecological lesions also varied somewhat in the different psychopathic groups; thus, in the senile dementia patients the chief lesions found were relaxations; the imbeciles, and those suffering with dementia præcox, showed a preponderance of develop-

¹ Deutsch. med. Woch., 1912, xxxviii, 689.

² Journal of the American Medical Association, 1912, lix, 713.

mental insufficiencies, but of particular significance was the great frequency of uterine displacements, associated with inflammatory trouble, in the manic-depressive group. The author believes, as a result of these investigations, that every woman suffering with manic-depressive insanity should be subjected to a thorough gynecological examination, and that any lesions found should be corrected, since experience has shown that it is in this group that the greatest number of mental cures may be expected.

Gastro-intestinal Conditions Simulating Gynecological Lesions. Attention is called by Reed¹ to the fact that the exceedingly common symptom-complex—constipation, headache, painful menstruation, and ovarian tenderness, may often be due primarily to conditions entirely outside the genital sphere, even when associated with these symptoms some actual displacement of the uterus can be demonstrated. Patients presenting these or similar symptoms are usually treated from the gynecological standpoint alone, the constipation being blamed on uterine pressure, and the headaches on reflex influences. That many of them improve but little, if at all, under such treatment, however, is well known to everyone who has had much experience with cases of this sort; Reed has found that under these circumstances a careful *x*-ray will usually show the presence of a general gastrocoloptosis, which is the fundamental source of the trouble, most of the symptoms being referable to the absorption of toxins. He does not wish to be misunderstood, as implying that in *every* case in which gastropoptosis can be demonstrated by the *x*-ray the above symptoms are necessarily present, nor as denying the importance of correcting any considerable uterine displacement that may exist, but merely wishes to emphasize that when these symptoms are present, associated with both gastro-intestinal and uterine displacements, the former will generally be found to be of much greater etiological importance than the latter, and not until they are corrected will the patient be relieved.

In the diagnosis of gastric and colonic conditions of this type, stereoscopic radiographs are strongly recommended by Case,² the Director of the Röntgen Laboratory at Battle Creek, Michigan. He says that, with the modern improvements in plates and apparatus, it is now possible to take a pair of stereoscopic radiographs of the intestinal tract within less than one second, so that a practically identical condition is registered on each plate, even in the presence of active peristalsis. The great advantage of this method over the single plate is the production of something approaching a real *picture*, instead of a mere flat record of shadows of varying degrees of intensity, whose meaning must always be more or less a matter of inference; apparent kinks are

¹ Journal of the American Medical Association, 1912, lix, 354.

² Proceedings of the Royal Society of Medicine, 1912, vol. lxxiii; Fortschr. auf d. Gebiet. d. Röntgenstrahlen, 1912, xviii, 399.

often shown to be well-rounded loops, and other serious errors in diagnosis from ordinary plates corrected. Taken in connection with the now pretty generally used fluoroscopic examination of the gastrointestinal tract, this stereoscopic work, so admirably worked out by Dr. Case, opens up prospects of an intimate knowledge of the living pathology and pathological physiology of the abdomen but a short time ago undreamed of, and hence is to be welcomed as a most valuable addition to our diagnostic methods in many of these border-line cases.

DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE THYROID GLAND, NUTRITION, AND THE LYMPHATIC SYSTEM

BY ALFRED STENGEL, M.D.

THE BLOOD

Red Cells. There have been a number of interesting observations made on the erythrocytes during the past year and especially with regard to their fragility, and it seems probable that in the near future valuable results will be obtained from this work. Pel¹ has carried out a series of experiments on 58 normal dogs and 30 splenectomized dogs. He tested the blood of these dogs against salt solutions in various concentrations, and found that the average concentration of the salt solution where the beginning of hemolysis was discernible in the normal dogs was 42 per cent., while in the splenectomized dogs it was 35 per cent. The average concentration at which complete hemolysis occurred was 30 per cent. in the normal dogs; and 23 per cent. in the splenectomized dogs. This showed a difference of 12 per cent. for both the normal and splenectomized dogs between the beginning and completion of hemolysis. The only conclusion the author justified himself in drawing from this work was that in splenectomized dogs there was an increase of the resistance of the red blood corpuscles to hypotonic salt solution which was not dependent on any morphologic change.

Along the same line as the work of Pel, Karsner and Pearce² have experimented with the blood of splenectomized dogs with the view of ascertaining the resistance of the red corpuscles to hypotonic salt solutions and hemolytic immune serum. They found that the erythrocytes after splenectomy showed an increased resistance to both hypotonic salt solution and to specific hemolytic immune serum. The degree of resistance was found to increase with the length of time after splenectomy. They determined that this increase in resistance on the part of the red cells was not due to an autohemolytic power of the animal serum or to a diminished complementary value of the serum, but to a property dependent on the erythrocytes themselves. Healthy,

¹ Deutsch. Archiv f. klin. Med., 1912, cvi, Nos. 5 and 6.

² Journal of Experimental Medicine, December, 1912.

non-splenectomized animals, after receiving a single injection of specific hemolytic immune serum and developing in consequence a temporary anemia, showed, on recovery, an increased resistance on the part of their red blood corpuscles, and in these instances no autohemolysis could be demonstrated. The splenectomy was always followed by an anemia of variable grade, and it seemed probable that the increased resistance developed by the corpuscles was a concomitant of red-cell regeneration following such anemia, and was analogous to the increased resistance of these cells which was observed in various forms of experimental anemia. The authors thought that there was no evidence to indicate that the anemia following splenectomy was dependent on the presence of hemolytic bodies, or that the heightened resistance of the red cells was due to antihemolytic bodies accumulating in the serum as the result of obliteration of the spleen. It was evident, therefore, that the spleen in some manner controlled or regulated blood destruction and perhaps regeneration.

Snapper¹ has made observations similar to those of Pel, and Karsner and Pearce. He found that the red blood corpuscles obtained after hemorrhage were more resistant than those obtained beforehand, the newly formed cells being less easily hemolyzed than the older ones. The young corpuscles forming in the regeneration period showed greater resistance than the older corpuscles.

Hendricks² makes a very interesting deduction from the foregoing facts. He says, the increase in the resistance of the erythrocytes to hypotonic salt solution may be looked upon as a compensatory mechanism against the further destruction of the red cells. The destroyed cells appear to bring about the immunization of the newly formed ones. After injections of benzidin, the maximal and minimal resistance show a considerable increase; after the injection of saponin and oleic acid, the minimal resistance sinks, while the maximal remains the same. Benzidin is a plasmotropic blood poison which, through a special influence over the liver and spleen, causes these organs to destroy more erythrocytes. From another side, its action has been sought in an alteration of the erythrocytes themselves which renders their destruction by both the spleen and liver easier than that of normal cells. Unlike this, saponin and oleic acid act directly upon the erythrocytic formation centres (bone marrow), with the effect that fewer red cells are produced. It is, therefore, possible to determine through the resistance of the red blood cells whether an anemia is a primary, myelopathic one or a secondary anemia due to increased destruction of the erythrocytes.

Leukocytes. In discussing Arneth's nucleo-analytical method, as applied to eosinophiles, Hultgen³ comes to the following conclusions:

¹ *Biochem. Zeitschr.*, xliii, p. 256.

² *Deutsch. Archiv f. klin. Med.*, cvii, No. 4.

³ *New York Medical Journal*, January 27, 1912.

First, the eosinophiles show no progressive development from monomorphism to polymorphism, except in leukemic conditions. Second, five classes of eosinophilic nuclei occur constantly with remarkable uniformity, under the most varied circumstances. Third, we may accept Class C, containing a distinctly bilobed or bipartite nucleus, as the normal eosinophile, as the one recurring constantly in all persons, well or unwell. Fourth, Arneth's neutrophilic picture is applicable to the eosinophiles, but it merely indicates a constant percentage composition of the eosinophile contingent of the leukocytes. Fifth, Arneth's eosinophilic blood picture exists, but it is only a statistical fact, and not of any practical biological significance. Sixth, Ehrlich's theory that the adult eosinophile is derived from a prototypic eosinophilic myelocyte, is not supported by the author's investigations; commonly accepted criteria as to the youth of any given leukocyte must be amended. Seventh, the morphological varieties of eosinophiles depend on primordial genetic causes; they are not a product of development. Eighth, since the morphology of the nucleus bears little or no relation to the origin, size, age, or function of these eosinophilic leukocytes, the nucleo-analytic method of Arneth lacks a biological foundation and is therefore not applicable to these cells.

Briggs,¹ in his investigations, found that the nuclear formula of the neutrophiles, as described by Arneth, held true for normal blood. In the different infections, such as typhoid, malaria, tuberculosis, and the pyogenic infections, "the shift to the left" occurred regularly. This "shift to the left" consists of an increase in the cells, with fewer nuclear units, and a corresponding decrease of the cells with many nuclear units. The extent of this shift is roughly in proportion to the severity of the infection. In typhoid, however, this shift is always marked, irrespective of the individual case. In typhoid, malaria, and the pyogenic infections, these changes appear to have little practical value as an aid to prognosis, etc.—but because these changes do occur constantly, Briggs believes an estimation of these cells should be made with every complete blood examination. In tuberculosis, the Arneth formula for the neutrophiles appears to be an aid in prognosis, although this estimation needs further confirmation.

Ringer² is of the opinion that the Arneth blood picture has a definite prognostic value in pulmonary tuberculosis. It is a corroborative factor to the general clinical picture, but should never be given much weight in contradistinction to the general symptom-complex presented by the patient. In a small number of cases it will presage an unfortunate outcome, or else will cause us to pause before giving a bad prognosis. He believes the method is to be viewed with conservatism. In a majority of cases it will faithfully represent the patient's resisting

¹ California State Journal of Medicine, August, 1912.

² American Journal of the Medical Sciences, October, 1912.

powers, but will not disclose any new features. According to Ringer, few who take up the Arneth blood picture, and study it carefully, will ever abandon it entirely, but he who places implicit confidence in its readings and bases his prognostic opinion chiefly thereon, will not infrequently be led into error.

After extensive researches in various acute and chronic infections, Ebbell¹ finds that vegetable parasites have no influence whatever upon the eosinophiles, except, perhaps, in a destructive sense; while animal parasites seem to invariably produce an eosinophilia and to have an attractive action on the eosinophiles. This power is possessed as well by different substances derived from the animal kingdom, such as organ extracts, serums, certain drugs, etc.—while substances from the vegetable kingdom do not possess these qualities. The local eosinophilia which often takes place after a bacterial process, Ebbell attributes to the local destruction of blood corpuscles. Asthma, scarlet fever, acute articular rheumatism, chorea, leukemia, and pseudo-leukemia, he finds, are accompanied by an increase in the eosinophiles; and he inclines to accept this as a proof that these diseases are caused by animal parasites. This leads him to conclude that drugs which are efficacious against animal parasites are indicated in these diseases. He suggests that salvarsan, on this basis, is indicated in scarlet fever. He points to the fact that only for the animal parasitic diseases do we possess any specifics, and he cites the example of quinine in malaria, salicylates in rheumatism, and arsenic in chorea and multiple sarcomatosis. On the other hand, he calls attention to the fact that we have no specifics against bacterial disease.

Petry's² experiments on the bone marrow and leukocytes of horses, led him to the following conclusions in regard to the eosinophiles:

The eosinophile substance is neither bactericidal nor antitoxic in ordinary amounts. No toxic action is demonstrable upon the animal body. The eosinophilic granules contain a kortolabile substance which gives indophenol synthesis. In the autodigestion of the leukocytes, the granules go into solution. When introduced under the skin of experimental animals, the eosinophilic granules were taken up by the fibroblasts, brought into solution, and later formed into granular iron pigment. In the bone marrow, on the contrary, the entire eosinophilic granule is changed into iron flakes. The organism can make further use of these stores of iron which are laid up in this resistant form from the plasma of the leukocytes. This eosinophilic substance undoubtedly plays a role in the metabolism of iron.

Schlecht and Schwenker³ found that, after the parenteral injection of a foreign proteid of animal origin, there appears in guinea-pigs and

¹ Norsk Magazin for Le givdenskaten, Christiana, May, 1912.

² Münch. med. Woch., August 27, 1912.

³ Deutsch. Archiv f. klin. Med., cviii, Nos. 3 and 6.

in dogs (with high doses) a peripheral eosinophilia. In anaphylactic shock there occurs intensive blood eosinophilia. In the lungs of guinea-pigs subjected to the injection of a foreign proteid of animal origin there is a marked eosinophilic infiltration and a marked peribronchial increase of these cells. This eosinophilia can be brought about by the inhalation of a sensibilizing serum. The peribronchial and pneumonic infiltration is strongly eosinophilic, in contradistinction to the neutrophilic infiltration seen in bacterial pneumonias. An eosinophilic peritoneal exudate appears on the first injection and on the reinjection. In Arthus' phenomenon, the cells of the inflammatory edema are chiefly eosinophilic. After the severe symptoms of shock wear off, the intestinal mucous membrane of dogs suffering with enteritis anaphylactica shows a local eosinophilia in the submucosa. A local histogenetic origin of the eosinophiles was not observed in any of these conditions. It is probable that the eosinophilic cells play a definite part in parenteral proteid digestion, and especially in anaphylaxis. The author is inclined to the explanation that in the parenteral disintegration of proteids, there arise products which act chemotactically on the eosinophilic cells. These cells are derived from the blood and bone marrow, in which, as the authors have previously shown, they are present in increased numbers in anaphylactic conditions. They were unable to find what substance or substances had attractive action on the eosinophiles.

Aubertin and Giroux¹ have found that the x -rays act in a stimulative manner upon the eosinophiles, as well as upon the neutrophiles. In normal subjects, in which the neutrophiles are the preponderating element, the x -rays in small doses will call forth a neutrophilic leukocytosis. The authors report a case of leukemia in which the eosinophiles constituted 65 per cent. of the white cells. The immediate reaction to the x -rays showed especially an eosinophilic increase whereas, in leukemias where the neutrophilic cells are in the majority, neutrophilic increase is most marked as an effect of the x -rays. The x -rays therefore act equally upon the eosinophilic and neutrophilic elements, and thus differ in their action from bacterial infections, which produce a neutrophilic reaction exclusively. The x -rays in moderate doses bring about a migration of the eosinophilic cells into the blood. In larger doses they act in a destructive manner on these cells.

The Blood Platelets. The blood platelets have received more than their usual share of attention during the last year, and some of this work, especially that associating these bodies with the coagulation process is not only of great interest, but also of clinical value. As to the origin of the platelets, there is still doubt, the observations of different authors leading them to different conclusions. Port and Akiyama² make the statement that the histological origin and the func-

¹ Presse Médicale, July 13, 1912.

² Deutsch. Archiv f. klin. Med., cvi, Nos. 3 and 4.

tion of the blood plates are not yet surely known. However, from their observations, they are independent forms and not disintegration products of other cells. They found, in a series of infectious diseases, that the number of blood plates held an inverse relationship to the height of the fever. With remission of the fever, there was a rather active increase in the number of the platelets, and then, after a few days, the number sank to normal (250,000 per c.mm.). In diseases of the blood, the findings were various. Normal values obtained in anemia and chlorosis, while in pernicious anemia there was a decrease. Many cases of myeloid leukemia and a case of pseudoleukemia showed an increase in the number of blood platelets. Decrease in the coagulability of the blood was accompanied by decrease in the number of the platelets. The findings in chronic diseases were variable and not characteristic. While these authors maintain that the platelets are independent forms and not disintegration products, Brockbank¹ concludes, as a result of a long series of observations, that these bodies known as blood platelets arise from the interior of red blood corpuscles, the corpuscle bursting and setting the platelet free. The bursting of the red cell is brought about through contact with the atmosphere, with the slides, or with the cover-glass. He notes that the platelets are especially abundant in anemia of secondary origin, where the color index approximates the normal, in contradistinction to those anemias in which there is a high color index.

Foti² likewise believes that the platelets originate from the red blood cells which have been destroyed or modified. He found that the blood platelets increase greatly in rabbits after the intravenous injection of pyrocin in 1 per cent. solution. Pyrocin has an evident destructive action on the red corpuscles. The increase in the number of platelets, according to Foti, corresponded exactly to the number of red cells destroyed.

Eminet³ found that the platelets react specifically to certain stains in certain diseases; as, for instance, in an animal intoxicated with the diphtheria poison the blood platelets stained with Sudan III. He has demonstrated this specific reaction in tuberculosis, scarlet fever, malaria, and syphilis, and calls these specific blood platelets soterocytes. The platelets, when subjected to the action of diphtheria toxin *in vivo*, or to that of the Loeffler bacillus itself *in vivo*, does not show the same specific staining as those in tuberculosis or scarlet fever. He believes this reaction to be of not only diagnostic, but of prognostic importance. He has observed the formation of the platelets in the lymph glands and bone marrow, and has found these small bodies having a specific staining affinity in different diseases segmenting

¹ Lancet, June 8, 1912.

² Riforma Medica, December 18, 1912.

³ Archiv f. Kinderheilkunde, lvii, Nos. 4 and 6.

within the lymphocytes and then quickly appearing in the blood stream. He states that with every injection of a sufficient dose of a disease toxin there occurs an increase in the number of blood platelets, and this increase is proportional to the size of the dose, within certain limits. If a very large dose of the toxin be given, the number of platelets decreases.

Not suggesting that the fever of infectious diseases is due to destruction of the blood platelets, it is interesting to note, in view of Port and Akiyama's observation of the inverse relationship of the number of platelets to the height of the fever, that Freund¹ has found that, when homologous or heterologous blood platelets are destroyed, a substance arises which produces fever. Toxic and infectious causes can bring about destruction of the sensitive blood platelets. This toxic action brought about by the injection of blood platelets appears to be due to a ferment. The fibrin ferment contained within the platelets is not the cause, according to Freund, but he suggests that the proteolytic enzyme may be the cause.

Since the relations of the blood platelets to hemorrhagic disease concern the platelets specifically, we will discuss the relationship here.

Bayne-Jones² has been able to corroborate the earlier investigations showing that the blood platelets contain a substance which, in the presence of calcium salts, causes fibrinogen to clot. This substance is known as prothrombin. Jones believes that the disintegration and solution of the platelets when blood is shed are helpful or essential to the clotting of blood in two ways: (1) By setting free a quantity of prothrombin which is subsequently activated to thrombin; and (2) by liberating a thromboplastic substance (thromboplastin) which neutralizes the antithrombin normally present in the blood.

In this connection, it may be of interest to enunciate briefly the two principal theories regarding the coagulation of the blood: The one proposed by Morawitz conceives that the tissues over which blood may pass, or the disintegrating blood platelets in blood that is shed, furnish an activator or kinase which converts prothrombin into thrombin in the presence of calcium salts, and thrombin in turn in combination with fibrinogen produces fibrin (clot). Another theory proposed by Howell conceives that in the circulating blood we find as constant constituents fibrinogen, prothrombin, calcium salts, and antithrombin. The last-named substance holds the prothrombin in combination, and thus prevents its conversion or activation to thrombin. When the blood is shed, the tissues or the disintegration of the corpuscles (platelets) furnishes material (thromboplastin) which combines with the antithrombin and thus liberates the prothrombin. The latter is then activated by the calcium and acts on the fibrinogen to produce fibrin

¹ Deutsch. Archiv f. klin. Med., cvi, Nos. 5 and 6.

² American Journal of Physiology, xxx, No. 74.

(clot). According to this theory of Howell, the process of coagulation involves but three factors—fibrinogen, prothrombin, and calcium, which exist normally in the circulating blood, but are prevented from reacting by the presence of antithrombin.

By comparing symptoms and blood findings in all patients observed during a period of three years who displayed a pathological tendency to bleed, it has been possible for Duke¹ to pick out a certain group of cases which presents a characteristic clinical picture due wholly or in part, it is believed, to an enormous reduction in the number of blood platelets.

The disease in its severer form almost constantly presents the following symptom-complex: (1) Purpura of one or two types—petechiæ or ecchymoses. (2) Hemorrhages from mucous membranes. (3) A tendency to bleed from every vascular lesion, no matter how produced. In consequence of this tendency, the bleeding time is very greatly prolonged, often exceeding two hours. (4) A normal coagulation time. (5) A firm blood-clot. (6) In consequence of the absence of platelets, a clot which does not retract and extrude serum. In all cases (7) seen by Duke showing the above picture, the number of platelets was reduced almost to the vanishing point. Counts were all below 10,000, and, as a rule, below 1000. (The normal platelet count varies from 200,000 to 400,000.)

The disease in its milder form presents a different picture. The most common symptoms in the milder cases are ecchymoses following slight injuries and epistaxis. Sometimes neither purpura nor bleeding from normal mucous membranes appears, and the only evidence of hemorrhagic diathesis is severe hemorrhage accounted for to a greater or less extent by local causes; for example, continued bleeding from intestinal ulcers, from esophageal varices, profuse and prolonged menstruation, etc. The bleeding time, in the mild cases, is sometimes normal and sometimes slightly or moderately prolonged. The coagulation time is normal, the clot firm, retractility diminished. The diagnosis rests on the finding of a reduced platelet count. It varied in Duke's cases (6) from 20,000 to 65,000.

Hemorrhagic diathesis can be followed best in this disease by determining the bleeding time at frequent intervals. The simple observation of purpura, spontaneous hemorrhage, etc., may lead to false conclusions in regard to the general condition, for these symptoms are often due to general and local causes combined.

When there was opportunity to make such observations, it was noted that the disease appeared when the platelet count fell to a extremely low level, persisted so long as the count remained low, and disappeared as soon as the count rose.

¹ Archives of Internal Medicine, x, No. 5.

The disease was relieved immediately, in 2 cases, by direct transfusion of blood. The relief was coincident with an increase in the platelet count, evidently a direct result of the transfusion. Symptoms returned when the platelet count fell again.

The disease was produced in rabbits by reducing the platelet count with diphtheria toxin. The disease appeared the day the platelet count descended to a point of almost complete absence and persisted until the platelet count rose. Hemorrhagic diathesis in mild form was brought about with repeated injections of benzol. In the latter experiments, the count did not descend to such a low level as in the former.

In a series of 38 animal experiments, in which the platelet count was enormously changed with subcutaneous injections of benzol, diphtheria toxin and tuberculin, and also in a large series of cases in humans in which routine platelet counts were made, only those having extremely low counts gave the complete symptom-complex described above. Several platelet counts between 40,000 and 75,000 were observed in patients who had no marked tendency to bleed. This seems to be the level at which patients may or may not have an abnormal tendency to bleed. No counts lower than these were observed in patients not subject to hemorrhage.

The disease has been observed complicating a varied set of diseases—in severe form in lymphocytic leukemia, hemorrhagic smallpox, tuberculosis, nephritis, benzol poisoning, aplastic anemia and diphtheria. The one feature in common in these cases was the low platelet count and the modification of the clot dependent on it, *i. e.*, absence of retractility. Purpura hæmorrhagica of the type described would seem, therefore, a symptom, not a disease. It is caused apparently by any agent which reduces the platelet count to a sufficient degree.

Bone Marrow. Gruner,¹ of Montreal, gives a review of the bone marrow from the standpoint of the clinical pathologist. His conclusions are based on the observation of marrow tissue obtained from about 200 autopsies performed at the Royal Victoria Hospital in Montreal; and from rats and rabbits the subject of experimental inoculations. The spleen and lymph nodes were investigated in the same series of cases in order to contrast the appearances in the different hematopoietic organs. His descriptions of the different varieties of marrow seem worthy of note. He says a low-power view of normal marrow shows engorged capillary vessels coursing between fat spaces of variable size, in the interstices of which there are clusters of the proper cells of the bone marrow. The nature of such cells cannot be made out by the low power, save that the nucleated red cells stain more deeply than the others. When examined by the aid of the oil-

¹ Canadian Medical Association Journal for July, 1912.

immersion lens, the chief cells seen are the myelocytes. A moderate number of small, round, deeply-staining cells, the erythroblasts, is also seen. A succession of fields showing cells in these proportions would indicate a typical combined white and red cell formation.

ERYTHROBLAST REACTION. In tissue showing an erythroblast reaction, the number of normoblasts is relatively much greater, and frequently megaloblasts, or even gigantoblasts, may be noted. In addition, a number of indeterminate cells of variable size may be detected. Such a reaction is well-marked in cases of septic infection in which there is a good response to the destruction of blood, as well as in anemias due to any cause which does not paralyze red-cell formation. It is a constant finding in infants' marrow, as first shown by Lossen.

EOSINOPHILIC MARROW. Here the successive fields in a marrow film present conspicuous numbers of eosinophile cells, easily seen by the bright red color of the granulation. In the hospital series, such a change was met with in severe septicemias, and in a case of chronic nephritis. It is frequently met with in tuberculous cases, but eosinophiles are absent, or very rarely seen, in cases of typhoid and diphtheria. In pneumonia, they are frequently scanty.

LYMPHADENOID MARROW. This form of change is of considerable importance, seeing that it is characteristic of lymphatic leukemias, some pseudoleukemias, Hodgkin's disease, and, in a modified way, of aplastic anemias. The cells are nearly all non-granular, vary much in size, and belong to the group of "mother cells." A similar phenomenon is also seen in bacterial infections in which there has been exhaustion of the marrow, with resultant leukopenia and lymphocytosis. Red-cell formation is also frequently defective, shown by the small proportion of nucleated red cells.

This change, according to Oehme, Marfan, Bandouin, and Feuillie Hutinel and Tixier, is very strikingly seen in rickets. It occurs in a focal form, according to the hospital series, in some septicemias, and in a widespread form in typhoid, tuberculosis, and in bronchopneumonia of infants. Lossen found the lymphocytes very numerous in children. Allied to this type is that met with in cases of Sternberg's leukosarcomatosis, in which the tissue is occupied by densely packed, round cells of medium size. These cells are entirely pathological in form, though they may be classified under the leukoblast series.

DEGENERATIVE MARROW. The characteristic of such marrow is the prevalence of cells in various stages of degeneration, already referred to. Phenomena of this type are well-marked in the severe infections—pneumococcic, streptococcic, and colon infections, gangrenous appendicitis, and typhoid. As already referred to, this change may be carried to the extreme of production of autolysis of the cells with liberation of the ferment granules and solution of the cell body.

A finding of this kind is of profound significance in relation to the problem of the cause of sudden death during the course of severe toxemias.

MEGAKARYOCYTIC MARROW. In this tissue, the megakaryocytes are considerably increased in number. The relation of these cells to the bloodvessels is variable. Some authorities aver that they are sessile upon the capillary walls, and dangle their long pseudopodic arms into the blood stream, so that slight concussion may detach fragments of their limbs and cause them to appear as blood platelets (Bunting). This view is not accepted by every authority. The important point about these cells, in relation to the pathology of granulomatous formations elsewhere, lies in the appreciation of the heraldic sign of the cell type—the nucleus—which presents a loose, basket-like formation.

Megakaryocytes are scanty in cases of tuberculosis, cancer, chronic nephritis, and all bacterial infections. They were found to be very abundant in a case of aneurysm in which leakage had taken place for a considerable time. They are increased in pneumonia, septicemia, and appendicitis. Degenerative changes in such cells are worthy of note.

FATTY MARROW. In this case, the fat spaces are not only increased in number, but the interstitial specific tissue is much diminished in amount. This is a physiological change in old age. In infections in which the marrow tissue has been exhausted, the fatty tissue becomes preponderant as a compensatory change.

FIBROID MARROW. The replacement of both fatty and formative tissue by a spindle-cell tissue, in which lie collections of small, round, inflammatory cells, occurs during the course of chronic inflammatory processes in the long bones. The marrow tissue proper is here replaced by the new cells. Such a change may be focal or diffuse, just as tuberculous or septic or luetic inflammations of bones may be focal or diffuse. If focal, areas of marrow tissue would alternate with the fibroid portions.

GELATINOUS DEGENERATION. The fat spaces are normal in number but the interstitial tissue between them is changed, having lost many of the specific cells and acquired a hyaline appearance. Gelatinous degeneration may be focal or diffuse, and may be associated with atrophy of the cancellous bone or may occur as an almost imperceptible change among the fine-meshed trabeculae of a rather ossified marrow cavity. It may or may not be associated with disseminated foci of formative or fatty marrow. This form is not identifiable in film preparations. It occurs with diseases associated with starvation-prolonged diarrhea, carcinoma, or prolonged cases of suppuration.

Many of the types of marrow change above referred to are the classical types. It may be noted, however, that it would be more

correct to divide up the marrow changes into such groups as erythrotoxic, leukotoxic, myelophthisic, myeloplastic, erythroplastic, erythrodegenerative, leukodegenerative, and so on.

As, from time to time, anemias which were formerly classed as of the primary pernicious type, have been thrown into the secondary class by discovery of their cause, one has been compelled to wonder whether there exists a true primary pernicious anemia in the sense of Addison. Although this thought exists, we are compelled to admit today that there is a large class of cases which clearly come within Addison's definition. The probability of the close relationship of primary pernicious anemia and secondary anemias has been thrust upon us. Zypkin¹ goes a step farther. In a voluminous article in which he discusses the blood diseases—anemias, pseudoleukemia and leukemias—he concludes that the known blood diseases are dependent upon a single pathological process, and that different stages of this process appear under the influences of the toxic agents in the circulating blood. It is sufficiently clear how the demarcation between leukemia and pseudoleukemia varies, and this is true also of pernicious anemia and pseudoleukemia. Every blood disease, according to Zypkin, must begin with an anemia, that is, with a destruction of the red blood corpuscles. According to the strength or severity of the toxin, it may remain as such; or the pathological agent may give rise to a hyperplasia of the hematopoietic parenchyma. This hyperplasia can, in turn, assert itself in different degrees, according to the strength of the toxin. It can stop within the bounds illustrated by the changes in the various infectious diseases; or it may be so intensive that it may go on to an embryonalization of the blood-forming parenchyma. In the first instance, a benign affection of the blood results; in the latter case, in consequence of the embryonalization of the cells, a cachectic condition arises as in pernicious anemia, the pseudoleukemias, and the leukemias. If the embryonalization confines itself to the colorless parenchyma cells, the result of the destructive action of the toxins upon the erythrocytes is masked through the increased proliferation of the normoblasts. The latter are not affected by the embryonalization, and are called into activity through two factors: the regenerating impulse, and the direct influence of the toxin upon them. By virtue of these two factors, the loss of the erythrocytes is easily covered up and oftentimes there is even distinct excess, as in polycythemia vera, which, therefore, is not an independent blood disease, but only a symptom which may accompany chronic pseudoleukemia as well as chronic leukemia. If the embryonalization does not confine itself to the colorless cells, but affects also the nucleated red cells, the regeneration of the erythrocytes becomes markedly

¹ Virchow's Archiv, July, 1912.

disturbed, and, in consequence, there appears an anemia as a direct result of the destructive action of the toxins upon the erythrocytes, without its being in any way masked by an adequate regeneration. Should this occur in leukemia there would result an accompanying anemia. The same applies also to pseudoleukemia, and especially to those forms known under the designation of pseudoleukemia lymphatica and pseudoleukemia lienalis.

Wichern and Piotrowski¹ are led to believe, from their studies in a number of cases of various forms of anemia, that the polychromatic erythrocytes and those showing basophilic degeneration are the products of regeneration. The appearance of these elements in the blood represents the power of the organism to form new blood, and it is probable that first the polychromatic cells, then the basophilic cells, and finally the nucleated red cells are sent out from the bone marrow in the attempt of the organism at regeneration.

SECONDARY ANEMIA. Bates² has made a study of secondary anemia in Panama and on Taboga Island. The cases in Panama were chiefly *malaria* or *uncinariasis*, or, in the majority, a combination of the two. The earlier writers on tropical diseases usually classed the severe secondary anemias under the head of tropical anemia, except cases with enlarged spleen and a history of antecedent malarial fever, because of the idea that the tropical heat, etc., caused the anemia. Better observation has proved that the tropical heat does not cause an anemia, but that the anemia is secondary to several specific diseases, and later writers have attempted to class this anemia under the head of its particular cause, such as malarial cachexia, *uncinariasis*, *ankylostomiasis*, etc. It would seem, according to Bates, that these anemias are almost always the result of several causes combined, such as malaria, *uncinariasis*, and semistarvation. Therefore, the term "tropical anemia" is a useful one, and it should be revived to include all secondary anemias of the tropics, and malarial cachexia should be abandoned, for it usually directs our effort along the wrong lines of treatment. Moreover, uncomplicated malarial fever tends to establish a relative immunity and does not eventuate in a grave secondary anemia, unless semistarvation is present. *Uncinariasis* may cause a severe secondary anemia, but, in most instances, lack of good food is largely the contributing cause. Malarial fever and *uncinariasis* in the same individual, if untreated, always result in a severe secondary anemia, and *uncinariasis* is the more responsible for the anemia when both infections are present in the same person. Food, and Bates emphasizes this, poor in quality and insufficient in amount, is the most important contributing cause in tropical anemia; and this anemia is usually in direct proportion to the poverty of the people. The enlargement of the spleen is

¹ Deutsch. Archiv f. klin. Med., cvi, Nos. 5 and 6.

² Journal of the American Medical Association, January 27, 1912.

primarily due to malarial infection, and the ultimate changes in the spleen are probably influenced by various intercurrent infections. Regardless of a history of antecedent malaria, treatment in these tropical anemias should be directed toward the uncinaria, no matter how few are present, and to the improvement of the food supply.

Franchini¹ discusses *anemia due to the presence of cercomonas in the intestines*. He reports a case in which there had been recurring attacks of a severe anemia throughout a period of twelve years. These attacks would be followed by long intervals of comparative health. They were characterized by weakness, abdominal pain, and diarrhea. During the attack observed, the red cells numbered 500,000 and the hemoglobin was down to 17 per cent. The presence of cercomonas in the stools was discovered, and treatment against this parasite resulted in rapid cure. He cites another case in a woman who had had symptoms of gastric ulcer for years. The ulcer perforated, and the pus from the circumscribed peritonitis showed the presence of cercomonas in great numbers. He does not attribute the ulcer to the presence of the protozoa, but believes that they aided in the chronic irritation.

A case very similar has been reported by Guastalla, in which the gastro-intestinal symptoms had been noted at intervals for twenty years before the parasite was found in the stools.

Treatment. Musser has studied a series of 14 cases treated with hypodermic injections of *iron and arsenic*. He found that ferric citrate, in doses large enough to have good effect, was too irritating. The injection was painful and the patients rebelled at the treatment. He then resorted to the use of iron in combination with arsenic and sodium glycerophosphate. These were used in the proportions of iron and arsenic, of each, 0.06 gram, sodium glycerophosphate, 0.10 gram, and distilled water, 1 c.c. This solution is clear, without sediment, slightly alkaline, and of a reddish hue. It is put up in small glass ampules, sterilized and sealed, and is then ready for instant use. Each ampule represents one dose. Musser says this injection may be given in any muscle, but that the most satisfactory sites in ambulatory cases are directly into the muscles of the thigh or the deltoid. The solution is so free from irritating qualities that it was not found necessary to give the injections deep into the gluteal or lumbar muscles. The treatments were given once a week, as a rule, but, in some cases, daily injections were resorted to for a time. It was noted that, in some of the cases, treatment of the cause had been carried out for some time with no improvement until after the iron and arsenic had been resorted to. In the majority of instances, the treatment consisted simply of correction of dietetic and hygienic faults. Of the 14 cases treated in this manner, only 1 failed to give a prompt response.

¹ Polyclinico, Rome, March, 1912.

Anemia of Infants. This subject was discussed in *PROGRESSIVE MEDICINE* last year. Although pallor is often found among infants of all ages, anemia is found almost exclusively in the first year of life. It is the custom, says Czerny,¹ to call all pale children anemic, but anemia should be distinguished from paleness, which may be of nervous origin and is often found in cases in which the blood is normal. In order to diagnosticate anemia, the mucous membrane should be pale as well as the skin, and an examination of the blood should show a deficiency in hemoglobin and in the number of the red cells. Anemia after the second year is rare. It does not occur from insufficient feeding alone, for it may accompany a diet which is not only sufficient in quantity but more than sufficient for the needs of the child. It develops among children who have been fed on milk diet exclusively for a long time. This anemia of alimentary origin comes on gradually. The pallor of the skin and mucous membrane, and the poverty of the blood, may be the only symptoms of the disease. Sometimes these may be associated with hypertrophy of the spleen, in which cases the splenomegaly is primary and is followed by the anemia. The author believes that, in these cases with splenomegaly, there is a predisposition to anemia along with an hereditary lymphatic temperament. It develops at a time when the child is quite fat, to which Czerny gives particular weight, for his experience has shown that the obese condition is developed only while on a food rich in fat, such as milk. Children who cannot tolerate milk, and are consequently fed on a mixed diet, do not develop this anemia. Softening and lack of development in the muscles is another accompaniment of the disease. This alimentary anemia, developed from an exclusive milk diet, must be treated by a correction of this diet. In mild cases it proves sufficient to withdraw a portion of the milk and to fill out the ration with cereals, vegetables, and fruit. In severe cases, the absolute exclusion of milk, or its reduction to 100 or 200 grams a day, is necessary. In addition to cereals, vegetables, and fruit, Czerny allows meat twice a day. In rearranging the child's diet, strict attention must be paid to the digestive power, especially when diarrhea is present.

Pernicious Anemia. Nothing new has developed during the year in pernicious anemia. The major portion of the writing has been devoted to treatment. In regard to the INITIAL SYMPTOMS OF PERNICIOUS ANEMIA, Schauman² has been devoting his time for years to the study of previous histories in this disease, endeavoring to find some early characteristic features which may be peculiar to it. This condition may exist, according to the author, with a hemoglobin percentage that is nearly normal, and it is the careful examination of the blood upon which we must depend for a diagnosis in many cases. He gives

¹ *Annales de Médecine et Chirurgie Infantiles*, October 15, 1912.

² *Deutsch. med. Woch.*, June 27, 1912.

the details of a typical case in which suspicion was first aroused by a periodically recurring feeling of soreness in the tongue and mouth, and sometimes in the throat. Upon examination of the blood, the variation in the size of the red cells confirmed the diagnosis. In the exacerbation, the hemoglobin dropped from 90 to 53, and the red cells became abnormal in size and shape. As the condition improved under the administration of arsenic, the erythrocytes regained their normal appearance.

THE ASSOCIATION OF PERNICIOUS ANEMIA WITH TUBERCULOSIS has been studied by Courmont and Dufourt.¹ From their own observations, and their gleanings from the literature, they conclude that in pulmonary tuberculosis there is often a condition of the blood which is similar to the aplastic form of pernicious anemia. (More frequently, undoubtedly tuberculosis causes chloro-anemia.) They think that this anemia is due to the action of the tubercle bacillus in its production of toxins. From their observations of the disease, and from their experiments with animals, they believe that either the bacillus injures the blood-forming apparatus itself, or that there arise through the injury of the digestive tract, the liver, and the kidneys, toxins which form autolysins for the erythrocytes. In their animal experimentation, the authors have shown that inoculation with tubercle bacilli causes a distinct fall in the number of erythrocytes.

Camp² has reported a very interesting case of pernicious anemia which caused changes in the spinal cord and a mental state which resembled paresis. The patient was a German, aged forty-six years, married, and a merchant by occupation. His history is entirely negative, with the exception that he had typhoid fever in 1885. He particularly denied venereal disease. Three years before admission, he was taken rather suddenly with some difficulty in walking. Aside from this, his only complaint was of some indigestion and constipation, and sometimes cramps in the leg muscles. On admission, he appeared somewhat emaciated and walked with a spastic, ataxic gait, which was made much worse by closing the eyes. His station was good with his eyes open, but, on closing them, he would sway and fall. The pupils reacted normally to light and to accommodation. There was no intra-ocular palsy and no nystagmus. Knee-jerks were diminished, and the Achilles-jerks were absent. There was complete loss of sensation and of position in the toes on both sides. Plantar irritation caused dorsal movement of the toes on both sides. The blood count revealed 2,900,000 erythrocytes; 7,300 leukocytes; 80 per cent. hemoglobin. The differential count showed 42 per cent. polynuclear; 17 per cent. large lymphocytes; 12 per cent. small lymphocytes; 6 per cent. eosinophiles; 2 per cent. mast cells; 3 per cent. transitional and 18 per cent. of degenerative types.

¹ *Gaz. des hôpitaux*, 1912, No. 16.

² *Medical Record*, January 27, 1912.

Lumbar puncture was done on October 31, and 15 c.c. of cerebrospinal fluid were withdrawn. This fluid revealed no abnormalities. He developed mental symptoms, with exaltation, and it was impossible to fix his attention on anything outside of himself. From November 7 on, he frequently refused to take his medicine, saying that it was poison, but gave no reason why anyone should want to poison him. His treatment with iron and arsenic was kept up during his stay in the hospital, and before his discharge, on November 14, examination of the blood showed 3,700,000 red cells; 5500 white; 87 per cent. hemoglobin. Differential count: 63 per cent. polynuclear; 26 per cent. lymphocytes; 1.2 per cent. transitional; 3 per cent. eosinophiles; 6 per cent. basophiles; 5 per cent. degenerative; many platelets, marked poikilocytosis, and some polychromasia. Dr. Hewlet concluded that the case was pernicious anemia probably in the stage of remission. The blood examinations, however, are certainly not convincing.

Examination in the above case pointed to lesions in both the posterior and lateral columns of the spinal cord, the former shown by the ataxia, Rombergism, sensory changes, and lost Achilles reflexes, and the latter by the spasticity and the positive Babinski reflex. The positive Babinski and spasticity would preclude the diagnosis of uncomplicated tabes, as would also the absence of any change in the pupillary reflex and the absence of any characteristic crises, lightning pains, and bladder disturbance. The negative findings in the cerebrospinal fluid would almost conclusively be against the diagnosis of paresis, or any syphilitic or parasymphilitic disease of the brain or spinal cord. That pernicious anemia can cause changes in the central nervous system, and especially in the posterolateral columns of the spinal cord, is well known through the writings of Putnam, Burr, Collier, Russell, Clark, Lloyd, and many others. Few authors, however, have called attention to the mental symptoms, though Addison and Ziehen have mentioned some mental changes in describing pernicious anemia.

Marcus described a case similar to the above in 1903, and Siemerling recently has recorded another case, with postmortem findings. The author concludes that it is of scientific interest, as well as of the greatest practical importance, to know that pernicious anemia can be the cause of a syndrome of nervous and mental symptoms that so closely resemble paresis that a clinical differentiation between them cannot be made with certainty without the examination of the blood and the cerebrospinal fluid.

TREATMENT. Hürter¹ says that although no effectual treatment in pernicious anemia is known, a number of empirical measures may prove useful, and that, when strictly applied, recoveries have been observed. The chief consideration is *rest in bed*, which the patients

¹ Med. Klin., December 31, 1912.

may often rebel against because of their feeling well. But the author insists upon bed rest until the blood shows marked signs of improvement. Alternating with rest in bed, *repose in the open air* is advantageous, and *light massage* may be useful. Our first duty is to thoroughly examine for intestinal parasites, and to investigate the functioning of the stomach. He considers *stimulation of the appetite* to be of predominant importance, and fruit juices and lemonade should be freely allowed. *Lavage* of the fasting stomach in the morning with physiological salt solution proves useful in simple achylia. *Nutrient enemata* are at times of value as a supplement to the ordinary food. He also favors *transfusion of blood*, and makes the transfusion as soon as the blood ceases to show signs of regeneration. The natural blood should be preferred, but, if one is not sure of the technique, the blood had better be defibrinated. He injects 200 to 300 c.c., using a 100 cm. syringe (Moritz). He has never observed anaphylaxis, but, in two of his 35 cases, dyspnea followed the transfusion. In 1 case, it suggested pulmonary embolism, but rapidly subsided. In the second case, the patient died two days later, and peculiar foci suggestive of intravascular coagulation, but not embolism, were found in the lungs. With the administration of *bone marrow*, he has noted transient improvement in the blood condition, and as we need all the power we can command to start the process of regeneration, he advises the use of bone marrow. The bone marrow is put up in tablets made from 90 parts marrow, 30 parts Port wine, 30 parts glycerin, and 20 parts gelatin. The marrow and the wine are mixed in one hot mortar, and the glycerin and the gelatin in another, and the two portions then combined. These tablets will keep for months. Hürter has a vague impression that glycerin in some way benefits these cases when given in large doses during the day. He gives 30 grams in lemon juice, 20 grams in capsule, and 30 grams by the rectum.

Benecke,¹ in his experience at the Jena clinic, found that the *intravenous infusion of defibrinated blood* resulted in no benefit in 5 cases of pernicious anemia which were treated during the last year. He is inclined to think that in one of these cases death was hastened by the use of the blood. Transfusions of blood in cases of pernicious anemia offer little hope and are without doubt sometimes harmful.

Lazarus² obtained excellent results by treating a case of pernicious anemia with *actinium-x*. The case, on admission to the hospital revealed a red blood count of 2,000,000, hemoglobin, 40 per cent.; and the white blood cells, 9000. After three weeks of treatment by means of rest, diet, gastric lavage, and arsenic by the mouth and by injection, the case showed no improvement, but, on the contrary, the red blood cells had sunk to 1,300,000, the hemoglobin to 32 per cent., the white

¹ Münch. med. Woch., March 12, 1912.

² Berl. klin. Woch., November 25, xlviii, 48.

blood cells remaining at 9000. The patient was then given an intramuscular injection of 50 E. S. E. actinium- α . Directly after this injection there was a tendency to improvement, and four days afterward the blood count showed 45 per cent. of hemoglobin and 2,116,000 red cells. On August 30, the day this count was made, she was given 150 E. S. E. actinium- α , and three portions of 50 E. S. E. each by the mouth. For nine days, from September 2, to September 10, she received 20 to 30 E. S. E. actinium- α by the mouth three times daily. On September 6, the red blood cells were 2,600,000, and hemoglobin, 48 per cent.; on September 14, hemoglobin was 42 per cent., red blood cells, 2,500,000. On September 24, hemoglobin, 52 per cent.; red blood cells, 2,500,000. On October 26 she received 80 E. S. E. actinium- α intramuscularly. On October 31, there were 2,500,000 red cells and 50 per cent. of hemoglobin. Throughout this time the white blood cells showed a tendency to return to normal. The first white blood count showed 9000 cells, with 44 per cent. of polynuclear neutrophiles; 3 per cent. eosinophiles, and 53 per cent. lymphocytes. On October 31, there were 6000 white blood corpuscles; 55 per cent. neutrophiles, 5 per cent. eosinophiles, and 40 per cent. lymphocytes. Parallel to the improvement in the blood picture was the improvement in the patient's general condition, especially the appetite. In four weeks there was a gain of five pounds.

Brieger¹ calls attention to the discovery of the frequently high antitrypsin content in the serum of persons with cancer, and the remarkable effect of *pancreatin* in bringing the antitrypsin titer down to the normal figure, while the general health improves. These, and other experiences, have suggested that there is a connection between the condition in regard to immunity and the condition in regard to protective ferments. He found that diphtheria antitoxin contains increasing amounts of antitrypsin with increasing immunizing power—all of which confirms the importance of an unusually high antiferment content in exhausting diseases, and the possibility of restoring conditions in this respect approximately to normal by pancreatin. He has applied these principles in the treatment of pernicious anemia, and reports 3 cases in which he gave Fowler's solution, by the usual dosage after meals, and pancreatin before meals. The rapid improvement, in all three patients, under this combined treatment was remarkable; neither alone proved effectual. A permanent cure was not realized, two of the patients dying later after they had given up treatment, but the third has been under supervision for three years; treatment is resumed whenever the blood findings show recurrence of alarming symptoms. A striking feature of the cases was the rapid drop of the antitrypsin content of the blood to within the normal range.

¹ Deutsch. med. Woch., November 14, xxxviii, No. 46.

The Leukemias. The position of the leukemias with regard to their classification shows no difference from that of last year when this subject was discussed rather fully. The difficulty in the differentiation of the acute types of leukemia still leads to many arguments and diverse views regarding this question. Some authors find but little difficulty in separating the types, while others argue against the possibility of such separation. Neumann¹ concludes two earlier communications in a third, in which he reviews the question of LEUKOCYTES IN LEUKEMIA. After some introductory remarks on the nomenclature, he enters upon a critical review of the unitarian and dualistic teachings. He weighs the evidence, from embryological, topographical, and experimental research (extirpation of the spleen), as well as from study of the transitional forms, which favors the one or the other of these views. He especially attacks the possibility of the certain differentiation of the mother cells (Stammzellen), as well as all the evidence which supports this possibility. He says that leukemia may be divided into many different types, according to the majority of the leukocytes in the blood. The character of the abnormal cells in the circulating blood may be dependent upon the nature of the hyperplastic process and not upon the place of origin of the cells. He discusses, on the one hand, the hyperplastic change of the bone marrow, and, on the other, the myeloid change of the lymph nodes and other organs, and likewise considers those cases of leukemia which are said to run their course without disease of the bone marrow. From this discussion, he concludes that it is not yet established which cells of the blood-forming organs give origin to the proliferation process; that apparently all leukemias have a myelogenic origin, and that a division into lymphatic and myeloid, in the sense of Ehrlich, is not established.

Steffler,² from his investigations, is led to believe, on the contrary, that differentiation between myeloblasts (granulocyten) and the lymphocytes can be surely arrived at through the oxydaze reaction (description and technique given in these pages in previous years). With Naegeli, he recognizes myeloblasts to be ungranulated cells with a netlike nucleus containing from two to four nuclei. The nucleus and nucleoli show a weak basophilic staining reaction. These cells, he holds, may appear spontaneously in other forms of leukemia besides the myeloblastic when these leukemias are growing worse, and also in certain forms of acute leukemia without any previous changes in the blood picture. There are some cases in which the appearance of myeloblasts in the blood stream has no ill significance. Steffler describes two myelemias in which this was so. In speaking of the oxydaze reaction for the differentiation of myeloblasts from lymphocytes, he says that the Röntgen treatment appears to be without influence upon this

¹ Virchow's Archiv, March, 1912.

² Deutsch. Archiv f. klin. Med., cvi, Nos. 3 and 4.

reaction. He believes, however, that this treatment may cause the transition of leukemias into the myeloblastic type, and he cites a case in which an intense treatment with the x-rays quickly led to such a fatal transition. Acute myeloblastic leukemia appears, in the anatomic sense, as an acute process. The oxydase reaction permits the certain differentiation of the myeloblasts from large lymphocytes. The course of the disease is somewhat slower than is usual in acute leukemias, in his case four months.

Paltauf¹ says that the so-called MACROLYMPHOCYTIC BLOOD PICTURE OF ACUTE LEUKEMIA (excluding the forms with an accompanying increase of the lymphocytes) can be brought about through essentially different processes. It may be the result of leukosarcomatosis of the neoplastic type rather than of the leukemic type. It may be the expression of a proliferating process, in certain ways closely related to acute myeloid leukemia, affecting exclusively the myeloblasts in the bone marrow, accompanied by secondary localizations, myeloblastic change in the spleen and lymph glands, hemorrhagic diathesis, etc.—myeloblastic leukemia. And finally it may be a reaction to an infectious toxic cause which injures the erythroblastic function of the bone marrow.

Hirschfeld and Jacoby² have investigated the RELATION OF CHICKEN LEUKEMIA TO AVIAN TUBERCULOSIS. They were able to demonstrate that, in tuberculous chickens, there was a morphologically characteristic hyperleukocytosis which at times might reach a very high grade, but this never should be confounded with the blood findings in chicken leukemia. The organs of tuberculous chickens were entirely free from the typical leukemic changes found by Ellerman and Bang which, in general, are similar to those of leukemia in man. Tuberculosis, with its accompanying blood changes, can be transmitted in different ways, especially by subcutaneous injection, while leukemia so far has been transmitted only by intravenous injection. The authors were able to produce, with regularity, a severe tuberculosis by inoculations with organs from tuberculous animals or with pure cultures of avian tubercle bacilli, but they were never able to produce a true leukemia through these means. By preserving parts of chickens' organs which contained both leukemic and tuberculous virus in a refrigerator at lower temperature (minus 10°) for a considerable time, and then inoculating animals with this material, they were able to demonstrate that it produced tuberculosis, but not leukemia. From this they conclude that the leukemic virus was destroyed by the low temperature, while the more resisting tubercle bacilli were not. Ellerman and Bang succeeded in producing leukemia with a filtered virus. On the few occasions when the authors tried to produce the disease with filtered virus, they were

¹ Wiener klin. Woch., January 4, 1912.

² Zeitsch. f. klin. Med., lxxv, Nos. 5 and 6.

not successful. However, they do not question the findings of Ellerman and Bang, but think that these findings are important in deciding the question of relationship between chicken leukemia and avian tuberculosis, although it is not known whether the tuberculous virus is filterable or not.

In view of this work, it is interesting to note the report of a case by Hirschfeld,¹ in which the signs and symptoms were characteristic of acute lymphatic leukemia. The patient died four weeks from the time of onset of the disease. There was fever, purpura, swelling of the glands, and a subleukemic blood picture. Thirty thousand was the highest leukocytic count, 98 per cent. of which were lymphocytes, and these were almost exclusively of the large cell type. There was a severe anemia, the hemoglobin being as low as 47 per cent. and the red blood cells 1,790,000. In addition to this, there were 4 per cent. of myelocytes. Post mortem, the histological findings showed the case to be a myeloblastic leukemia. The point of principal interest was the fact that huge quantities of microorganisms resembling tubercle bacilli were found in the necrotic parts of the lymph glands. The author wonders if, in this case, there was an accidental combination of tuberculosis and leukemia, whether the tuberculosis was secondary, as had been often observed in leukemic glands, or was the tuberculosis primary and the leukemia secondary, or could one perhaps think of an etiological connection between the bacillary infection and the leukemia. Undoubtedly the tuberculosis, in this case, was of very recent date for the patient up to the beginning of the disease, that is, four weeks before death, was entirely healthy and able to work. The leukemic and bacillary infections must have happened about the same time. Coley and Ewing have² reported a case analogous to this, in which the tubercle bacilli were recovered from the lymph glands and produced tuberculosis in monkeys and guinea-pigs on inoculation. Arndt³ has also reported a case of diffuse leukemic lymphadenoma of the skin, in which acid-fast bacilli resembling the tubercle bacilli were found in the skin, in an inguinal lymph node, and in a portion of the spleen.

Panton and Tidy⁴ have observed 25 cases of MYELOID LEUKEMIA in the last three years. Twenty-one of these cases showed the chronic form of the disease; 13 of these were men. If, in the reduction of the white blood corpuscles, the percentage of ungranulated cells, especially the myeloblasts, shows an increase, the therapy is too intense, and therefore injurious. The increase of these ungranulated leukocytes, which are either ungranulated myelocytes or lymphocytes—in the latter case a terminal lymphemia is at hand—is always a bad sign in

¹ Berl. klin. Woch., November 4, 1912.

² New York Pathological Society, 1910.

³ Dermatol. Zeitschr., Band xviii.

⁴ Lancet, May 18, 1912.

that it is a symptom of the failure of the leukoblastic functions. Before death these cells may increase to 95 or 98 per cent., in which case the blood picture may be confused with lymphatic leukemia. Other cases terminate through exhaustion of the erythroblastic function of the bone marrow. In the 4 acute cases of the series, the blood picture varied. The entire course of the disease ranged from two to six months, but the period of severe symptoms was much shorter. Distinct enlargement of the spleen was not present in any of the acute cases. In 1 there was a leukopenia; and in 2 of the cases, the large hyaline leukocytes were present in great numbers (79 to 84.2 per cent.).

MYELOBLASTIC CHLOROLEUKEMIA, with a plastic hyperchromic anemia, in a boy, aged eight years, is the subject of a report by Esser.¹ The boy had been entirely free from illness until six weeks before admission to the hospital when he was taken with fever, lassitude, weakness, and frequent vomiting. The course was short and attended with high remittent temperature, almost constant nose-bleed, and severe vomiting. Eleven days after admission, the child died. Two days before death, the blood count showed 25,000 white blood cells, 20 per cent. hemoglobin, and 590,000 red blood cells. Among the erythrocytes were many micro- and macrocytes. There was no polychromaphilia, no basophilia, and no erythroblasts. In this picture there are degenerative forms, but no regenerative forms. The differential count showed myeloblastic leukemia. The interesting feature of the postmortem examination was the finding of glandular tumors varying from the size of a hazel-nut to that of a plum at the hilus of the lung. This was especially noted on the right side. On section, these tumors were of a grass-green color and showed necrosis. A few of the cervical glands were involved in the same manner, and there were nodules found in the spleen and liver. Microscopic examination of the bone marrow (femur and rib) showed hardly any erythroblasts, but nearly all myeloblasts and a few neutrophilic and basophilic cells. The follicles of the spleen were relatively small and contained numerous basophilic granular cells. These cells, in the character of their nuclei, resembled the ungranulated lymphocytes. In the liver, there was intra-acinus proliferation of the myeloblasts, most marked under the capsule. The color of the tumors found at the hilus of the lung and in the neck disappeared quickly when exposed to the air. The follicles in these tumors were atrophic, and the interfollicular tissue contained numerous myeloblasts but no basophilic cells. The nodules in the spleen revealed myeloblastic proliferation. The authors believe, with Pappenheim, that leukemia, both lymphatic and myeloid, is a systemic disease of the hematopoietic apparatus in which proliferation can take place in a simple hyperplastic manner or with tumor formation

¹ Münch. med. Woch., October 1, 1912.

which may be colorless or green (chloromatous), and which can occur with or without leukemic blood changes (as a symptom). This case illustrates the close relationship, if not the absolute identity, of chloroma and myeloid leukemia, and goes far to support the statement of Burgess¹ to the effect that the tumors to which the term chloroma has been applied do not constitute a pathological entity. On the contrary, they represent a part of the pathological process in one type of acute myelogenous leukemia. Myelogenous leukemia is a blood metastasis, according to Burgess, of a true tumor formation whose origin is in the bone marrow and whose cells invade the blood stream and bone marrow. In certain cases in which the cells are, most of them, undifferentiated, and multiply rapidly, other tissues are invaded. Sometimes in this way definite nodules or masses of tumor cells are formed. These masses, if green, are called chloroma.

Bierring² is in accord with this view when he concludes, from a clinical study of 2 cases which he reports, that CHLOROMA is not a distinct disease entity, but belongs to the primary diseases of the blood-making parenchyma. It is a generalized systemic affection of the lymphoid hematopoietic apparatus characterized by the tendency to malignant growth and localization of its greenish pigmented infiltration. Two views seem to prevail at the present time in regard to the nature of chloroma. In one, it is identified with leukemia, and the other regards it as a sarcomatosis. A number of observers (Pappenheim, Sternberg) hold the view that all leukemias are to be regarded as malignant hyperplastic processes, and thus would harmonize the two prevailing views. Schridde classifies chloroma with the new growths of the blood-making organs, describing the lymphatic disease as chlorolymphoma and the myeloid as chloromyeloma. Borsch regards chloroma as sarcoma of the lympho-myelo-erythroblastic tissues, with occasional leukemic blood findings.

Bedell³ reports 2 cases of chloroma in which the blood pictures were decidedly different. The first case occurred in a boy, aged eight years. The tumors here were confined to the orbit. The blood examination showed 1,596,000 red blood cells, 30 per cent. hemoglobin, and 41,200 white blood cells, of which 37.9 per cent. were polymorphonuclear, 11 per cent. large mononuclear, 12 per cent. small mononuclear, 3.1 per cent. eosinophiles, 32.8 per cent. neutrophilic myelocytes, and 7.2 per cent. eosinophilic myelocytes. There was poikilocytosis, anisocytosis, and many degenerative white cells. The patient's condition grew progressively worse from the date of admission. Emaciation was extreme. Proptosis of both eyes became very marked, the eyelids being congested and the vessels tortuous and prominent. The case

¹ Journal of Medical Research, November, 1912.

² Journal of the American Medical Association, October 19, 1912.

³ Annals of Ophthalmology, July, 1912.

was removed from the hospital just before death, and no autopsy was permitted.

The second case occurred in a married woman, aged eighteen years, a Russian by birth. The patient was an undersized, delicately built, poorly nourished woman. The skin had a peculiar satiny texture and was of a grayish-yellow color. Several nodules about 2 cm. in diameter, which were attached to muscle and bone, were palpable in each breast and along the sternum. The axillary and inguinal glands were enlarged. The woman was eight months' pregnant; a systolic murmur was audible over the whole precordium and not transmitted. These were the only departures from an otherwise negative physical examination, except for the ocular lesions and blood changes. The blood was: Reds, 2,200,000; whites, 52,000. Differential count of 300 whites: Lymphoblasts, 45.2 per cent.; polynuclears, 10.6 per cent.; small mononuclears, 19.2 per cent.; large mononuclears and transitionals, 8 per cent.; eosinophiles, 3 per cent.; myelocytes, 0.7 per cent.; degenerated, 1 per cent.; 6 normoblasts, 1 megaloblast.

The patient died on April 16, after premature delivery of a dead child. For several days before death there was an uncontrollable hemorrhage from the nasal cavities. Post mortem, tumor nodules were found in the breast, on the under surface of the sternum, beneath the periosteum in the intercostal muscles, and surrounding the costal cartilages of the upper five or six ribs. There were three nodules found in the auricles of the heart, at the root of the left lung, and in the tail of the pancreas. There was a mass of large, green glands at the head of the pancreas. Many nodules were found in both kidneys. The prevertebral lymph nodes were markedly enlarged, and just above the bifurcation of the aorta there was a large mass of pea-green tumor tissue attached to the vertebral periosteum. The tumor tissue was firm in consistency and varied in color from a light green to an olive green. On microscopic examination, it was made up of small round cells, a few of which contained many refractive granules. The fluid obtained by teasing and expressing the glands contained many refractive granules which turned brown on exposure to osmic acid. The cells of the tumor tissue were of the embryonic type and generally of the lymphocytic series. There were also cells resembling those of a myeloma or myelocytes. Eosinophilic cells were common, many resembling myelocytes and others adult polymorphonuclears. There were other cells resembling, in general, the mast cell. The tumor was widely disseminated, and it occurred in more or less circumscribed foci. It also showed diffuse and transitional forms of growth. The extension may have been by way of the lymph or blood streams, for the tumor cells were found both beneath the endothelium and within the lymphatics and the bloodvessels. The predominating cells were of the lymphocytic series, but cells of the myelocytic series and endothelial cells occurred in

varying numbers. The nature and source of the pigment was not evident.

Ward¹ reports a case of NODULAR LEUKEMIA in which the cells comprising the nodular infiltrations were of the small mononuclear or lymphocytic type. The patient was a child, aged nearly two years, who had been taken with whooping cough six weeks before admission. It was noted that she was getting pale and showed signs of rickets. In a few weeks, swelling developed in the glands of the neck. There was slight exophthalmus, and an increasing anemia. The thought of chloroma arose, and the patient was admitted to the Royal Surrey Hospital on November 6, 1911. A few days before admission she had nose-bleed, and various parts of her body appeared as if bruised. Upon examination, it was noted that the patient lay curled up in bed, resenting any attempts to move her. The epiphyses seemed tender, and in the radius and ulnar they were thickened on both sides. The ribs were beaded. The skin was waxy and the mucous membranes white. There was no apparent exophthalmos. There was bleeding from the gums. The tongue was furred, and the heart and lungs were normal. The abdomen protruded. There was slight enlargement of the liver, but the spleen was not palpable, which may have been due to the fact that palpation was painful and not persisted in. The inguinal glands were enlarged on both sides, and there was a slight blood-stained discharge from the nose and purpuric spots on the legs. During the succeeding two months, there was a succession of septic troubles, with a progressing enlargement of the cervical glands and an increasing anemia. The blood count, made one month after admission, showed 1,950,000 reds, 235 nucleated red cells; white cells, 10,000, of which 42 per cent. were polymorphonuclear neutrophiles, 1.3 per cent. eosinophiles, 53 per cent. small mononuclears, 3.6 per cent. large mononuclears. There was marked poikilocytosis and polychromatophilia. The percentage of mononuclears was high, but the total number not higher than one might reasonably expect at this age. Moreover, the child was suffering from whooping cough, a disease which may of itself give rise to a leukocytosis as high as 100,000. In view of the later findings of lymphemia, this presence of whooping cough is of interest as a possible etiological factor, but probably the interest is more apparent than real. The right preauricular gland was the first to enlarge of those about the head. This has been noted in other cases. On more than one occasion the glands threatened suppuration, but this did not actually occur. There were, of course, abundant septic foci which might have led to breaking down of the glands—viz., middle ear disease, conjunctivitis, purulent rhinitis, and extensive aural lesions. The glands in the neck were enlarged, and the skin over

¹ British Journal of Children's Diseases, August, 1912.

them discolored, appearing greenish. This was not to be wondered at, as most of them were the seat of hemorrhages of varying extent. Other features were the presence of subconjunctival and other hemorrhages, and of a greenish infiltration of the scalp. The green color of the latter was not noted post mortem, and some, at least, of the apparent infiltration, was edema over the skull nodules found in that situation. These nodules never reached a great size and were not distinguishable during life. One of the most interesting features was the sudden appearance of several small skin nodules in the scalp. These were of the same color as the surrounding skin and lasted only a few days. There was also a rash on the back. It is not certain of what nature this was, but a rash has preceded the appearance of nodules in several cases. Post mortem, in addition to the other changes in the various organs, nodular growths were found in the kidneys, on the epiglottis, and under the scalp covering the major portion of the frontal and parietal bones. The internal aspect of these same bones was covered with flat growths of the same type and there were likewise nodules in the middle and posterior fossæ. In addition to this, there was a diffuse thickening of the dura mater, particularly marked about the torcular Herophili and the venous sinuses generally. Slides made by contact and not by smears were obtained from the glands, lymphoid tissue about the epiglottis, skull, liver, kidneys, adrenals, heart, bone marrow, dura mater, and spleen. In all of these there was found an excess of cells of a type identical with those of the blood (lymphoid). In many places there were masses of white cells showing that foci of the lymphoid proliferation had been cut through. The author notes, as further points of interest in the case, the fact that, in spite of hemorrhagic tendencies, there was good fibrin formation and no increase in the coagulating time. In addition to this, an enormous excess of the small bodies known as hemoconia was found in the blood. The difficulty which confronts one in the correct recognition of some of these cases and their proper classification is here clearly shown.

The following case, reported by McWilliams and Haines,¹ while showing the ease with which mistaken diagnosis may be made, likewise illustrates the facility with which a careful blood examination will reveal the true condition. The case was that of a married woman, aged thirty-three, who complained of a tumor in the right breast. The day after admission the tumor was excised, and, on pathological examination, a diagnosis of lymphoma was made. Five months later she returned to the hospital and there were nodules found in both breasts. All were growing steadily larger, and were free from pain or tenderness. There was no discharge from the nipples nor was there any loss of flesh or strength. In the right axilla there was a mass the

¹ American Journal of the Medical Sciences, April, 1912.

size of a hickory nut. The left axilla was normal. Upon examination, all of the other organs proved normal. The spleen was not palpable, and there were no other tumors or enlargements of the lymphatics. The Wassermann reaction was negative. A diagnosis of probable malignancy (sarcoma) was made, with a gloomy outlook for a permanent cure. She was seen by a number of men, none of whom suggested a blood examination. A radical removal of the right breast was performed, and numerous enlarged glands were removed, one being from the very apex of the axilla. One week after the operation a differential count was made, whereupon the diagnosis was cleared up. It showed 117,000 white cells, of which 90 per cent. were lymphocytes. The authors suggest that, in order to avoid such mistakes, a routine differential blood count should be taken in all surgical cases. In summarizing their report, they say the case is surely one of lymphatic leukemia with, however, very unusual features. The patient complained of, first, a tumor of the breast and probably referred any slight evidence of impaired health to this tumor, whereas the subsequent course of the disease and the autopsy showed that the breast was merely an incident in the leukemic process. The superficial lymph nodes were never enlarged. The spleen was not palpable until late in the course of the disease. A study of the various blood-forming tissues revealed a transformation from the normal to a tissue in which one type of mononuclear cell greatly predominated. The patient developed, toward the close, a severe enteritis, and it is interesting that the type of cell which took part in the inflammatory exudate was the mononuclear cell seen elsewhere so abundantly and not the polymorphonuclear leukocyte, a finding easily explained by the condition of the bone marrow in which very few myelocytes were found.

An extremely interesting case is reported by Barrenscheen.¹ He reviews the clinical course and gives the postmortem findings in a case of STAPHYLOCOCCUS AUREUS SEPSIS WITH LEUKEMIC REACTION ON THE PART OF THE BONE MARROW. The patient was a woman, aged thirty-eight years, who died within a week from the appearance of the first symptoms of acute leukemia. The blood count showed 5,500,000 red cells; 78 per cent. of hemoglobin; 12,200 white cells, of which 50.1 per cent. were polymorphonuclear neutrophils; 0.3 per cent. mononuclears; 4 per cent. small lymphocytes; 2 per cent. neutrophilic myelocytes, and 43.6 per cent. large lymphoid cells. On the second day, the count had risen to 59,200 leukocytes, while the myelocytes had increased to 7.8 per cent., and the irritation forms of Türk appeared to the extent of 1.2 per cent. The author contends that, in this case, it is better to speak of sepsis with a leukemic reaction of the bone marrow than of acute leukemia, and he prefers to look upon

¹ Wiener klin. Woch., February 22, 1912.

acute leukemia as nothing else than a reaction of the bone marrow to a septic infection, and says that chronic leukemia may be of the same nature. He calls attention to the fact that a brother of this patient was received into the hospital a short time afterward suffering with a typical lymphatic leukemia, and that a cousin had died about a year before from a similar affection. He discusses, briefly, the familial element in connection with leukemia, and says that this points to the probability that here we have a constitutionally diminished resistance to the factors causing this disease.

Stursburg¹ has observed 2 cases of septic infection with streptococcus in which the symptoms, signs, and postmortem findings were practically identical with the exception of the blood picture. In the first case the blood findings were those of leukemia and the postmortem examination revealed the existence of lymphatic leukemia which the author says probably preceded the sepsis. In the second case, the blood count showed the proportion of lymphocytes as abnormally small, and nothing was found postmortem to warrant a diagnosis of leukemia. The case was purely a streptococcus septicemia.

In a case of CHRONIC LYMPHATIC LEUKEMIA studied by Wesson,² the urinary findings were notable. The urine was reduced in quantity, and varied from a dark yellow to an orange color, was turbid, of a specific gravity of 1.025, acid in reaction, and did not react for albumin or sugar. In a twenty-four-hour specimen, there was usually a heavy voluminous brick-red sediment of amorphous urates, and not infrequently uric acid crystals were present. The blood counts revealed a range for the red cells of from 1,920,000 to 2,620,000. There was slight poikilocytosis and anisocytosis. Hemoglobin was 60 per cent. The leukocytes ranged from 168,000 to 560,000. For six weeks following admission they remained at 500,000, and then suddenly decreased to 225,000, at which level they remained. The small lymphocytes ranged from 94.2 to 80 per cent., the difference being counterbalanced by changes in the numbers of large lymphocytes and large mononuclears present. The neutrophilic polymorphonuclear cells varied from 1.2 per cent. to 0. The eosinophiles showed a variation of from 0.2 to 0.8 per cent. The neutrophilic myelocytes varied from 1.4 per cent. to 0. The eosinophilic myelocytes ranged from 0.4 per cent. to 0. The author made a search for ferments in the urine and found that there must have been some enzyme (maltase) present which had broken down the maltose molecule, and that a proteolytic ferment was also present. No amylolytic ferment was discovered. The presence of a fat-splitting enzyme was suggested, but was not very positive at first. Later it was quite evident that a lipase was present.

An extremely rare case (MYELOID LEUKEMIA) of great interest is

¹ Med. Klin., March 31, 1912.

² Medical Record, November 9, 1912.

reported by Goodall.¹ The patient was a female child, aged ten years, with a family and previous history of no importance. The child had been breast-fed and healthy until three weeks before admission, when the mother noticed that the child was of a bad color, and had begun to bleed at the nose. This bleeding at first was slight and infrequent, but became almost constant. Two days before admission, bleeding began from a small excoriation in the gluteal region. There was a fairly profuse diarrhea, but no hemorrhage from the bowel. Hematemesis also began two days before admission. Upon admission the temperature was 96, and the pulse 116. The child was undersized for its age. The fontanelles were widely opened and the hair scanty. There was great pallor and considerable emaciation. There were no signs of rickets or syphilis. The blood oozing from the nostrils and from the excoriation on the buttocks was watery looking. Over the trunk and limbs were scattered fairly numerous petechial spots. There were a few small ulcers on the tongue. Upon inspection, the abdomen revealed nothing abnormal. The liver was enlarged, reaching to $1\frac{1}{2}$ inches below the costal margin. There was no enlargement of the lymphatic glands. The spleen was enlarged and readily palpable, reaching to $1\frac{3}{4}$ inches below the costal margin. The blood flowed readily from a small puncture in the lobule of the ear, and, in spite of the use of cotton wool and adrenalin, the flow continued for ten minutes. Red corpuscles, 1,100,000; leukocytes, 75,000; hemoglobin, 22 per cent.; color index, 1. The blood was pale and watery. There was variation in the size of the reds; marked poikilocytosis, fairly pronounced polychromatophilia, and some basophilic degeneration. Nucleated erythrocytes were numerous. There were about 48,000 normoblasts and 54,000 megaloblasts to the cubic millimeter. The differential count revealed polymorphonuclear neutrophiles, 26 per cent.; large lymphocytes, 14.5 per cent.; small leukocytes, 9.75 per cent.; eosinophiles, 1.5 per cent.; neutrophile myelocytes, 46 per cent.; eosinophile myelocytes, 2 per cent.; basophiles, 0.25 per cent.

It was difficult to stain the neutrophilic granules in the polymorphonuclears and the granules in the myelocytes, but Ehrlich's triple stain and Jenner's stain in full strength for two minutes and then in dilute form for five minutes, brought the granules out distinctly. There was nothing of note in the other systems. The pulse could not be easily felt at the wrist, but could be counted at the fontanelles. Pledgets of cotton wool soaked in adrenalin, 1 to 1000, were applied to the nostrils, and excoriations on the buttocks. The food consisted of albumin water. Whisky was given in 10-drop doses every four hours. Vomiting of the albumin water showed a little dark blood. A green bowel movement which was passed contained no blood. The child collapsed, and, in spite of stimulation, death occurred at 8 P.M. on the day of admission.

¹ Edinburgh Medical Journal, June, 1912.

The postmortem examination, made sixteen hours after death, revealed nothing of note except the following: The lungs showed a few hemorrhages, the stomach contained some mucus and dark blood, the intestines were atrophied, covered with thick mucus, and here and there showed deposits of dark, altered blood. The lymphatic glands, thymus, thyroid, and adrenals showed no morbid change to the naked eye. The bones showed a remarkable thickening. In the sternum and ribs, the marrow was dark red, but small in amount. The cancellous tissue was very dense, and it was impossible to squeeze out any of the marrow. In the shaft of the right femur the medullary cavity was very narrow, and seemed to be crossed in all directions by thick trabeculae of bone. The marrow here was also dark red, but again it was impossible either to express or excise a portion of marrow even moderately free from bone. In the shaft and upper diaphysis of the right humerus, the same condition was found. The marrow was more abundant, but appeared to be all enclosed in small, thick-walled bony spaces. It was just possible to express enough to make film preparations.

The points of interest in the microscopic examination were centred in the bone and marrow. Transverse sections of the softened humerus showed no definite medullary cavity. There were a large number of spaces surrounded by thick, bony trabeculae. In many of these the remains of the primitive cartilage could be distinguished, but, except for their thickness, no abnormality could be detected. The marrow showed a complete absence of fat cells. All the available space was occupied by hemopoietic cells. The overwhelming number of these were myelocytes, but lymphocytes and eosinophiles were also numerous. A fair number of basophiles was scattered throughout. Nucleated red cells, both megaloblasts and normoblasts, were present. Giant cells were very scanty.

The case is of interest, in the first place, because of its rarity. This case is the nineteenth recorded authentic instance of myelocythemia occurring in infancy. The association of leukemia with osteosclerosis is still more rare, there being only 2 previous cases reported. Heuck described a case in a man, aged twenty-four years. The diaphysis of the femur and humerus had an unduly thick and hard cortical substance. The marrow cavity was very narrow, and was crossed by a fine network of bone containing fibrous tissue and marrow cells. The sternum and ribs showed a similar change. There were no large masses of marrow, and only small drops could be expressed. The skull was heavy, thick, and compact. Schmorl described a case in a man, aged twenty-eight years. The spongy bone was nearly all compact, even in the spine, epiphyses of the long bones, and in the sternum. The cells were typical of leukemia, but there was great fibrosis of the marrow. It may be noted that both authors specially mentioned the fibrous tissue in the

marrow. In the case here reported, the fibrous tissue was practically invisible.

A point of interest and importance is the difficulty which was found in staining the myelocyte granules, because of the fact that this may lead to confusion in differentiating between myelocytes and lymphocytes of the large variety. Zypkin¹ published a case of acute leukemia in which the leukocytic formula was as follows: Leukocytes, 658,000; polymorphs, 1.5 per cent.; lymphocytes, 3.6 per cent.; eosinophiles, 1.9 per cent.; basophiles, 0.2 per cent.; myelocytes, 6.2 per cent.; promyelocytes, 16 per cent.; myeloblasts, 70.6 per cent. To this diagnosis of acute myeloid leukemia Goodall objects, and prefers to consider Zypkin's case as one of acute lymphatic leukemia, because this is a much more common disease. The unusual occurrence is that of a leukemia, with myelocytes predominating, running an acute course.

TREATMENT. Of the measures which have been used sufficiently long to give us a fair estimation of their value in the treatment of leukemia, practically the only one which receives consideration in this year's literature is the *Röntgen ray*. Two new methods of treatment have been suggested and tried during the past year, the preliminary reports of one of which hold great promise. This is the administration of benzol advocated by Koranyi. Nemenow² has treated 8 cases with the x -ray, and 4 of these he has studied carefully, giving the metabolic and other findings in detail. He is led to believe that the benefit derived from this treatment is due, first, to the action of the rays on the leukocytes, and then, as the radiation is continued, to their action on the lymphoid tissues of the blood-producing apparatus. This, however, does not account for the changes which are evident in organs remote from the exposed areas, such as the decrease in the size of the enlarged lymph nodes and the changes in distant parts of the bone marrow. He believes that here we must consider the action of another factor—some leukotoxin, or leukolytic ferment, or possibly cholin, which exerts an inhibitory influence on the excessive proliferation in the blood-producing organs. In one case of severe chronic myelogenous leukemia, he has obtained what he considers a cure. In 3 other cases of this type, great improvement occurred. In 3 cases of the chronic lymphatic type, the treatment has been too recent to draw definite conclusions. One case of acute lymphatic leukemia showed no improvement whatever, and rapidly succumbed to the disease.

The experience of Biermann³ in the use of the x -ray in this disease has shown that the myeloid type responds better than the lymphatic

¹ Berl. klin. Woch., 1910.

² Zeitschr. f. klin. Med., Berlin, lxxv, Nos. 5 and 6.

³ Deutsch. med. Woch., January 4, 1912.

type. This is not in agreement with Pancoast, who finds the reverse to be true. Biermann declares that physicians should not wait for the leukemia to become severe before resorting to treatment with the *x*-ray, and that they should be on the watch for cases where leukemia may be suspected, where there is a history of persistent disturbances, such as a feeling of oppression and of tension in the abdomen, occasional vomiting, constipation, lassitude, pains in the sacral region, and "rheumatic" pains in the limbs, for which no other satisfactory explanation can be found. It may thus prove possible to apply the *x*-ray in a stage of the disease where it may have curative value, or at least prolong life in comparative health. He cites 1 case in which the benefit obtained was marked and permanent. The patient was a woman, aged thirty-seven years, who remained in good health eighteen months after treatment, the spleen being of normal size, the number of leukocytes 12,500, with no erythroblasts. When treatment was started in this case, the leukocytes numbered 450,000.

Thomas¹ has observed 6 cases of the splenomyelogenous type during the last five years, treated by means of the *x*-ray. The facts of importance taught by these cases are that under proper dosage almost hopeless cases will respond rapidly to treatment. This improvement is marked enough to cause the patients to feel that they are practically cured. The disease recurs after cessation of treatment. These recurrences are also amenable to treatment, though the response is successively less satisfactory. In none of the cases treated were there any untoward results of Röntgen radiation, such as toxemia or burns. Thomas believes that the Röntgen ray is the best therapeutic agent so far suggested for leukemia, the least dangerous, the most uniform, and the most permanent. He recommends the Pancoast method as the most rational and successful form of this treatment. Under favorable conditions, he says the leukemic patient may be restored to comparative health in a few weeks, and his length of life increased by a period of three to six years. During this period of increased life he is comparatively free from distressing symptoms.

Pancoast's² experience in conjunction with the writer has proved that certain features in the general technique of treatment with the *x*-ray require special emphasis:

1. The applications should be made systematically to the bones of the entire body, with the exception of the head, the body being mapped out into definite areas for the purpose.

2. Exactness in dosage is always most important. It should be so regulated as to produce the necessary effect without inducing toxemia, if possible.

¹ Cleveland Medical Journal, April, 1912.

² Journal of the American Medical Association, September 28, 1912.

3. The frequency of the applications is equally as important. They should be made daily when possible, and prolonged periods of rest should not be permitted. Life has been shortened months or even years in many instances through disobedience of this injunction, or failure to insist on it.

4. Direct exposure of the spleen and other secondary enlargements should be carefully avoided during the earlier part of the treatment; this applies especially to the very large spleens of the myelogenous forms of the disease. The first important reason for this is the avoidance of the undesirable toxemia that is likely to follow, especially in advanced, toxic cases; and the second is the fact that the more rapid decrease in the leukocytosis that is likely to follow is apt to be misleading because it is not due to the effect of the radiation on the primary seat of the disease entirely. In many instances, this will lead to a discontinuance of the treatment long before the greatest possible inhibitory effect on cell-proliferation has been induced. The spleen and other enlargements should receive a share of the applications by all means, but always at a later and safer period, when the leukocytosis has diminished considerably and the general condition improved to such an extent that the additional waste products can be taken care of adequately and eliminated without any danger from toxemia. The spleen should not be treated at the expense of the bones, but should be included as an additional region to receive its share of the applications in its turn.

5. The leukocyte count may be an important clinical factor in showing the patient's condition, and is perhaps the most direct single index we have as to the effect of the treatment on the disease, but it is by no means so dependable in the latter application as it is generally regarded. In fact, it should not be relied on to any extent as a direct index, except at practically one stage of the treatment. If we are able to reach the point where the leukocyte count has subsided to normal or nearly normal figures, the differential count becomes more and more important as the guide for continuing or stopping the applications.

6. If the count remains stationary for some time, at a comparatively high figure, after it has dropped to a certain extent, as is frequently the case, moderate doses of arsenic will usually lend the necessary assistance to the *x*-ray in lowering the count further. Unless indicated in this way, or by a decided anemia that does not improve, the use of arsenic during radiation does no good, and only causes confusion.

Blood examinations should be made frequently throughout the treatment, and especially leukocyte counts. As a rule, the leukocytosis is apt to increase to a certain extent for a while after beginning radiation of the bones, but this should never be regarded seriously unless accompanied by increased toxemia, or unless the general condition becomes worse. A normal leukocyte count is never, in itself,

an indication to stop, but treatment should be continued as long as myelocytes are present, or the differential count remains distinctly abnormal. If we are so fortunate as to bring about a restoration to normal percentages, treatment may be discontinued; but a differential count should be made subsequently at least once a month, and, on the return of distinctly abnormal percentages, radiation should be resumed immediately, without waiting for the appearance of any other manifestations of a relapse. This is one of the secrets of prolonging life in the most favorable cases. Arsenic should be avoided particularly at such times, as it tends to delay the appearance of the first signs of a relapse and the needed radiation.

7. Arsenic is frequently a valuable adjunct to radiation, as already explained, but it is too often misused. It should never be given in large doses during radiation.

8. Particular attention should be paid to the care of the skin from the very beginning, as the ultimate result or the duration of life, at least, may be largely dependent on the tolerance of the integument. Adequate x -ray filters should always be employed, and the applications made through the clothing as an additional precaution. The quality of the output of the x -ray tube should also be carefully watched.

9. Radiation is contraindicated in practically all cases of acute leukemia, as it will only hasten death. The same may be said of many chronic cases during acute stages with associated severe toxemias, although considerable benefit may be derived from the treatment of some of these cases.

10. Of all the patients who have responded in any way favorably to the treatment, it has been our experience that those of the lymphatic type give somewhat better ultimate results than those of the myelogenous type.

Barker's discovery of the destructive action of *benzol* on the blood has led Koranyi¹ to use this substance in the treatment of leukemias and polycythemia. In the treatment of chronic leukemia with this means he has had no failures. The spleen decreases to its normal size, but the lymph nodes seem to be less influenced. The benefit from this mode of treatment is more gradual than that from the Röntgen ray, but the benzol may succeed where the Röntgen ray has failed. Previous Röntgen treatment seems to render the patient more readily responsive to the action of benzol. No serious by-effects have been observed, even in a case where he had given as much as 5 grams per day. In some cases, however, slightly disagreeable effects were noted, such as burning in the stomach, eructations, temporary tracheo-bronchitis, and vertigo. Koranyi has avoided the stomach disturbance by administering the benzol in a capsule with an equal amount of

¹ Berl. klin. Woch., July 15, 1912.

oil. He reports the case of a woman, aged thirty-two years, who seven months previous had noticed enlargement of the spleen. She became very weak and complained of pains in the sternum. Blood examination revealed 3,100,000 red cells and 220,000 white cells, of which 16 per cent. were myelocytes. On February 1, 1912, she was given an *x*-ray treatment. Two weeks subsequently treatment with benzol was begun, from 3 to 4 grams a day being administered. In April, the leukocyte count was 65,000, and this had decreased to 8000 by the middle of May, and there was marked improvement in the general health. The patient at the time of this report was about and attending to her usual duties.

Kiralyfi¹ has also applied this method of treatment with success. He prescribes benzol with olive oil in equal parts, and gives it in capsules, each containing 1 gram of the mixture. The initial dosage is 4 capsules per day, and this is increased to 2 capsules five times a day. The author has found that the leukocytes, under this treatment, return to normal and that the leukemic lesions subside. In some cases, the leukocytes dropped from 300,000 to 8000 when nothing else, not even the Röntgen ray, had had any influence on their numbers. The drop in the leukocyte count was accompanied by improvement in the other symptoms. In the cases so far observed, the course of treatment has ranged from three weeks to six months, and the ages of the patients from twenty-one to sixty-nine years. The cases were mostly of the myeloid form. One case of lymphatic leukemia was treated, and here the improvement was very rapid, the leukocytes in three weeks dropping from 131,200 to 7200. This case a year previously had received 20 exposures to the *x*-ray and the leukocytes decreased only from 80,000 to 40,000, while the lymph glands grew larger. In another case cited, there was an atypical response to the benzol. In three weeks of treatment, the leukocytes fell only from 140,000 to 100,000. The treatment was then suspended and there was an increase in five days to 290,000 followed by a drop in ten days to 65,000, and in fifteen days to 15,000. This case showed marked improvement in the symptoms from the beginning.

Stein² reports a case treated with benzol for six weeks with very favorable results. In administering the drug, he combines it with oil like Koranyi, but gives it in a capsule which is insoluble in the stomach. The patient was a woman, aged sixty-seven years, who had obtained only slight and temporary improvement from a systematic course of Röntgen therapy. Under this treatment the leukocytes decreased from 225,000 to normal, and the blood picture approximated the normal. At the same time, the subjective symptoms disappeared, and the patient gained in weight. The spleen, which at first

¹ Wien. klin. Woch., August 29, 1912.

² Ibid., December 5, 1912.

extended to the median line and to below the level of the umbilicus, decreased in size until it was no longer palpable. When the benzol treatment was suspended, arsenic was substituted for a time.

Falta, Kriser, and Zehner¹ report 4 cases of leukemia which they had treated by means of *thorium-x*. Two of these cases were of the lymphatic type, and 2 were of the myeloid type. The first, in a man, aged forty-three years, was an extremely severe case of lymphatic leukemia with trachoma. The leukemia had been present since 1909, and the man had been treated with the *x*-ray for some time with only moderately good effects. During the last few months of treatment, the *x*-ray seemed to have little or no effect, and, during the month of January, the white blood count showed a rapid increase up to 1,000,000. A few days after the beginning of the thorium treatment there was an increase in the leukocytes up to 1,700,000, and then a rapid fall to 20,000. The subjective symptoms were better. During the next three days after the rapid fall there was an increase to about 180,000, and again a fall to 100,000 following another injection of thorium. The spleen decreased in size until it was not palpable. The lymph glands became smaller and softer. There was no apparent influence upon the lymphatic infiltration of the skin. Five days after the last injection the patient was taken with a high fever, physical signs of pneumonia developed, and death occurred on the ninth day. The autopsy showed severe lymphatic leukemia and extensive pneumonia, especially on the right side. The second case reported was that of a woman, aged fifty-two years, with lymphatic leukemia who, at the beginning of treatment, showed a white blood count of from 600,000 to 700,000 leukocytes. The patient was weak, dyspneic, and suffered from pain in the splenic and hepatic regions. Under treatment with gradually ascending doses of thorium, the leukocytes gradually fell to 200,000 in number and the erythrocytes showed an increase from 2,500,000 to 3,000,000 in the course of twenty-six days. The spleen had become smaller, much softer, and movable. The subjective condition was very good. The third case reported was that of a woman, aged thirty-one years, with myeloid leukemia. The white blood count in this case ranged between 600,000 and 650,000 cells. In the course of twenty days of treatment with thorium in gradually ascending doses, the leukocyte count fell to 200,000, and the erythrocytes increased from 3,000,000 to 4,000,000. The spleen was softer and decreased in size. Douglas' pouch in this case was filled with hard glands which, under the treatment, disappeared. The subjective condition was good and the patient remained up and about all day.

The fourth case reported was that of a girl, aged seventeen years, with myeloid leukemia. This patient was a typical case, and had been

¹ Wien. klin. Woch., Vienna, March 21, 1912, xxv, No. 12.

treated by the x-ray with good effect. For the first five days while under the observation of the authors, the leukocytes ranged gradually upward from 150,000 to 220,000. With the beginning of the thorium treatment in increasing doses, the leukocytes quickly fell until the present time, twenty-three days after the beginning of treatment, when there was a normal count. There are now 3 per cent. myelocytes and 5,000,000 erythrocytes. The subjective condition is splendid. The authors consider this merely a preliminary contribution, and do not desire to come to any conclusions as to the results of this treatment on the strength of so few cases being observed, and because of the short time of observation after treatment.

Primary Splenomegaly. The literature on primary splenomegaly has not been very abundant during the past year. *Banti's disease* is given a moderate amount of discussion, and Banti describes a new type of splenomegaly, while Mandlebaum reports another case of the Gaucher type with the postmortem findings, thus adding another to the few cases already recorded with histological studies.

In an elaborate review and discussion of Banti's disease, Stein¹ says it is evident that there is still much to be learned before we arrive at the true interpretation of Banti's disease. So far as the author can see, no earnest effort has been made, aside from the work of Banti himself, to enter into a thorough study of the histologic basis of the disease, and, hence, we are bound to take Banti's work as the standard, and accept the interpretation placed by that author upon the nature of the disease, its genesis, symptoms, and treatment.

This standpoint, with certain limitations, will serve as a working basis from which the teachings of Banti can be extended. It lies in the nature of the disease that a splenotoxic influence of the blood on the tissues must be assumed. To make this the starting point of the whole question, however, is not satisfactory.

The metabolic disturbances so thoroughly noted by Umber can not be made the feature from which to establish a differential diagnosis. The determination of the disturbed nitrogen balance before removal of the spleen cannot be taken as an indication for or against operation, in spite of the fact that through this measure the metabolic balance is restored. Disturbed metabolism is a feature common to other conditions allied to Banti's disease, and probably in Banti's disease it is merely a phase in its course. It seems to the author that it is safe to look upon the disease as a splenomegaly or splenic anemia of a peculiar type (Banti, Senator, Osler). From a broad clinical point of view, it is a juvenile disease bearing the ear-marks of heredity or congenital disposition. Luce has pointed out that it develops usually at the time of adolescence or shortly thereafter, at a time when the lymphatic

¹ American Journal of the Medical Sciences, December, 1912.

structures of hereditary taint are most susceptible to degenerative influences. If we conceive of the disease as a primary infection of the lymphatic structure of the spleen, it seems entirely improbable that cirrhosis of the liver may be the underlying cause, although at times the clinical differentiation of Banti's disease from some cases of liver cirrhosis with marked splenic enlargement and anemia, as described by Hoke and Naunyn, must be difficult, if not impossible.

Careful study of the cases recorded shows, if we assume Banti's standard, that it is possible to delimit, pathologically, this disease from others with apparently identical conditions. Considerable confusion appears in the literature by confounding this disease with the Gaucher type of splenomegaly which is a distinct entity. It may be stated that there are some carefully observed cases still unclassified which hold a relationship to the Gaucher type, and have nothing in common with the Banti type.

In conclusion, the author says: "Banti has formulated one group of splenomegalies, that which bears his name, leaving for further research the grouping of other splenomegalies. The important factor of etiology he has left open. It is clearly the duty of other observers not to attempt to dissociate his symptom-complex, nor to designate an allied symptom-complex as Banti's disease, which differs intrinsically from that described by Banti."

Lichtwitz¹ reports a case of Banti's disease in a girl, aged seventeen years, who had suffered from chlorosis for three years. She showed jaundice which had been present for a long period, and, upon physical examination, the liver was found to be enlarged. There was an enormous splenic tumor. The blood picture was that of a severe anemia showing a few myelocytes and myeloblasts, along with nucleated red blood cells and eosinophilia. In a second case reported, the patient had been jaundiced since birth, as had his grandfather. Both of these patients enjoyed good general health.

Lichtwitz has collected 43 similar cases from the literature. Twenty-seven were congenital, and 33 familial. It is interesting to note that, in these cases, Lichtwitz found that although there was jaundice, and that bilirubin was present in the blood serum, no bilirubin was excreted in the urine. The author suggests that this may be due possibly to the fact that the skin discoloration was caused by some product of hematin from the broken-down blood cells and not by the bile pigment.

Neuberg² believes that Banti's disease is a well-characterized symptom-complex, but that the spleen is not the primary seat of the disease giving rise to the general symptoms. He holds that the cause must be sought outside of the spleen, for example, in congenital syphilis,

¹ Deutsch. Archiv f. klin. Med., cvi, Nos. 5 and 6.

² Zeitsch. f. klin. Med., lxxiv.

gastro-intestinal disturbances, malaria, tuberculosis, etc. Hence, under the name of Banti's disease should be classed a characteristic symptom-complex which may arise from various infectious toxic causes.

Banti's disease, according to Umber,¹ is diagnosticated too often. Its differentiation from other diseases with similar symptoms, as congenital syphilis, precirrhotic splenomegaly, liver cirrhosis, tuberculosis, sarcoma, and other neoplasms of the spleen is of great importance because, through the proper recognition of the disease, the patient may be entirely cured by splenectomy, if carried out at the proper time. On the other hand, a failure to make the proper diagnosis in this disease results eventually in death. The author believes that the syndrome is characterized by primary changes in the spleen which cause the toxic anemia and injury of the liver. It occurs in the young and is inevitably fatal, unless the spleen is removed. He reports 2 cases; one in a boy, aged ten years, the other in a young bank clerk, both apparently cured by splenectomy.

The liver cirrhosis in the Banti syndrome subsides following splenectomy if this same morbid process has not advanced too far. This retrogression does not occur in ordinary cirrhosis of the liver. Another special feature which the author calls attention to in the Banti syndrome is that the splenomegaly is not accompanied by enlarged lymph glands or nodes. He gives the metabolic findings in his cases and considers the estimation of the nitrogen balance to be of great importance. In both of his cases, before the splenectomy there was present a pathologically increased nitrogen loss of a high grade on a constant nitrogen intake, while at the same time the body weight remained constant, or there was even a slight increase. After the splenectomy, on the other hand, the nitrogen exchange became normal, or there was even a slight nitrogen gain in spite of a slight decrease in body weight. The author says there is nothing else to assume from this than that there is a toxic factor removed with the removal of the spleen.

Isaac² reports a case of Banti's disease in the first stage, extreme splenomegaly with anemia, the liver being normal. The case was under observation for several years, remaining in this condition. The patient finally died from an intercurrent streptococcus infection. Postmortem, the liver was found to be intact. These cases of splenic enlargement and anemia with normal liver, running a course of long duration over a period of years, are very rare. According to Senator, it is only these cases in which the liver shows no change that should be classed as Banti's disease.

Klemper³ prefers the name of splenic anemia to that of Banti's

¹ Münch. med. Woch., July 2, 1912.

² Berl. klin. Woch., October 14, 1912.

³ Ibid., May 27, 1912.

disease. With Muhsam, he reports a case of the Banti syndrome in the first stage—that is, splenomegaly with severe anemia and no change in the liver. After treatment for a period with iodine and salvarsan, Muhsam removed the spleen because of increasing weakness in the patient. Immediately after the operation, the red blood corpuscles and the hemoglobin began to increase, and the patient showed steady improvement.

Urbino¹ reports 9 cases of Banti's disease in which he performed splenectomy, in 5 of which permanent cure resulted. These cases ranged in age from thirteen to forty-four years, and nothing to suggest syphilis was present in any of them. There was an antecedent history of typhoid in 3, and alcoholism was suspected in another. Six of these cases were in females. The first symptoms noted were loss of appetite, with digestive disturbances and diarrhea, which was sometimes bloody. Subsequently debility and depression appeared, and edema and anemia developed. There was an insidious course to the infection which progressed until local discomfort led to the discovery of the splenic tumor. Nose-bleed, headache, and hepatic pain were noted in some of the cases. The disease had run a course of from one to four years before splenectomy was performed. None of the cases of the advanced type was cured. Hence, Urbino says that grave hepatic lesions with ascites and a tendency to hemorrhage should be looked upon as contraindications to splenectomy. He further notes that the resisting power of the organism to infections is distinctly decreased shortly after the removal of the spleen and that these patients show a high susceptibility to infections which usually run a severe course.

Banti² describes an affection which, on the one hand, resembles the primary splenomegaly known as Banti's disease, while, on the other hand, it resembles hemolytic jaundice. In these cases there is no preceding history of malarial jaundice or syphilis, but the development of a progressive anemia in association with splenomegaly and jaundice without clay-colored stools. Urobilin and bilirubin are present in the urine and there is a special reaction on the part of the bone marrow indicated by changes in the morphologic elements of the circulating blood. He cites the case of a woman, aged twenty-six years, in which the anemia progressed rapidly. The erythrocytes fell from 4,000,000 to 1,615,000 in four months. A splenectomy was then performed, and the red cells in three months' time increased to over 5,000,000, and have remained normal. He cites a second case in a man, aged twenty-three years, in which splenectomy was followed by equally marked improvement.

Splenomegaly. A discussion of SPLENOMEGALY OF THE GAUCHER TYPE, with the report of a case, is elaborately made by Mandlebaum.

¹ *Archives Internationales de Chirurgie*, v, No. 3.

² *Semaine Médicale*, June 5, 1912.

Since the publication of the first case of this disease by Gaucher, in 1882, only 9 additional instances have been recorded in which the diagnosis was made by histological examination. Mandlebaum's¹ case is the eleventh, and has the distinction of being the youngest recorded case in which an autopsy was performed.

The pathological findings in the spleen, which apparently is the primary seat of the disease, have been variously interpreted by the different investigators. Gaucher was of the opinion that the splenic hypertrophy, idiopathic in nature, was a primary epithelioma of that organ. Collier described his case as an endothelioma of the spleen. Picou and Ramond declared, in their case, that there was a primary epithelioma of the spleen beginning as a benign process, finally becoming malignant and involving the lymph nodes. Cornil, who discussed their case, believed the process to be a primary hypertrophy of the spleen with proliferation of the reticulum. Bovaird characterized it as a hyperplasia of the spleen accompanied by an unusual development of endothelial cells, and the transformation of a considerable part of the organ into dense connective tissue. Brill, Mandlebaum, and Libman stated that the large cells arose directly from the endothelial lining of the pulp spaces or venous capillaries of the spleen. In their case, the large cells in the bone marrow were noted for the first time. Schlagenhauser concluded that the process was a systemic disease of the lymph hemapoietic apparatus, with proliferation of the reticular structures. Vonherczel thought the process was a benign newgrowth. Marchand believed that the process was not an ordinary protoplasmic hyperplasia or tumor, but a deposit of some foreign substance which, after the action of a certain chemical, leaves a vacuolated network in the cells. Brill, Mandlebaum, and Libman stated that the spleen, liver, lymph nodes, and bone marrow showed the presence of large cells with small nuclei and a peculiar hyalin cytoplasm. These cells arose from the endothelium or normal reticulum. Risel considered that the large cells were not derived from endothelium, but probably arose in the reticulum of the lymphatic hemapoietic system, the lymph and adenoid tissue being unaffected. Dejong and Vanheukelom decided that the cells arose from the reticulum, but stated that the possibility of an endothelial origin could not be denied.

Mandlebaum's case occurred in a boy, aged four and one-half years. The family history was of interest. The parents were healthy. There were four children; one sister of eleven years is living and well; another sister at nine years has an enlarged liver, which can be felt two inches below the free border. The spleen, however, is not enlarged, so the diagnosis is somewhat obscure. A third sister died at the age of eight years, having had a slow but progressive enlargement of the abdomen for four years. The liver was enlarged, and the spleen extended

¹ Journal of Experimental Medicine, December 1, 1912.

beyond the median line, filling the left iliac cavity. There was no history of hemorrhage or skin pigmentation. Blood examination showed 3,440,000 red cells, 6200 leukocytes, and 68 per cent. of hemoglobin, and the differential count was normal. The child suddenly developed dyspnea, with cyanosis, and died. No autopsy was obtained.

The boy's early personal history was uneventful except for measles one year ago. Shortly afterward he was thrown down by a horse, and the ambulance surgeon told his mother that the child had an enlarged spleen and liver. Upon examination, there was distinct discoloration of the face, from a light yellow to a golden hue, most marked at the bridge of the nose and around the eyes. The conjunctivæ were not discolored. The liver could be felt at the umbilicus; the spleen extended two inches below the umbilicus and over to the right mammary line. The superficial lymph nodes were not enlarged, and there was no tenderness over the bones. The Wassermann reaction was negative. Blood examination revealed 2,208,000 red cells, 500 leukocytes, and 35 per cent. of hemoglobin, with a normal differential count. He was referred to the hospital for splenectomy, and on admission the only complaint was slight pain in the right hypochondriac region, and a history of occasional epistaxis. The urine contained phosphates and had a specific gravity of 1.030. Temperature was 99°, respirations, 22; and pulse, 104. Blood examination at this time revealed 4,000,000 red cells, 4200 leukocytes, and 68 per cent. of hemoglobin, a coloration index of 0.85. The differential count showed 70 per cent. of polymorphonuclear, 25 per cent. large lymphocytes, 3 per cent. small lymphocytes, 1 per cent. mononuclear, 1 per cent. myelocytes, and no normoblasts. There was slight poikilocytosis and anisocytosis. Splenectomy was performed, and, because of the large amount of blood removed with the spleen, the child received an intravenous saline infusion of 12 ounces. The condition after the operation was good. The blood examination after the operation showed 3,860,000 red cells, 19,600 white cells, 66 per cent. of hemoglobin. There were 72 per cent. of polymorphonuclears, 20 per cent. of lymphocytes (large), 8 per cent. of lymphocytes (small). Within a few hours the temperature rose to 104°, and the child died on the following day. The spleen immediately after the operation weighed 490 grams (body weight, 10.5 kilos), and measured 18 x 9.5 x 5 cm. The organ was slightly elongated, the surface was smooth and of a peculiar brownish-salmon color. On section, the surface was mottled, due to the presence of transparent pearly areas mixed with minute hemorrhagic spots. There were no tubercles present. The particular points brought out in the autopsy were as follows: The abdomen showed no ascites. The liver weighed 730 grams and measured 20 x 13 x 6.5 cm. The surface was smooth, glistening, and the color a light pinkish yellow; the capsule was not thickened. Upon section, the same color was noted, the lobules were

poorly outlined, and some diffuse gray areas appeared. Situated around the medium-sized bloodvessels and slightly above the surface were a few wide, irregularly shaped areas whose borders were not well defined. The hepatic vessels and portal vein were normal. There were some enlarged lymph nodes at the hilus which were friable, semitranslucent, and light brownish-green in color, and, on section, were succulent in character. The gall-bladder and bile passages were normal. In the intestines, many of the Peyer's patches were enlarged and bright red in color. The last 5 cm. of the ileum were so studded with these patches that the normal mucosa was barely visible. The large intestines were normal. The tracheal and bronchial lymph nodes were enlarged. All the mesenteric and retroperitoneal nodes were enormously enlarged. The iliac lymph nodes were enlarged. The bone marrow was bright red in color with small white dots. Mandlebaum discusses thoroughly the histologic findings and enters into a general discussion of the case. He concludes, as a result of this study, that primary splenomegaly of the Gaucher type is a distinct disease, related, in all probability, to the blood diseases. It begins usually at an early age, frequently affects several members of a family, and runs a chronic course. The clinical manifestations are pronounced hypertrophy of the spleen, subsequent enlargement of the liver, absence of palpable lymph nodes, absence of jaundice and ascites, absence of characteristic blood changes, discoloration or pigmentation of the skin, and a tendency to epistaxis or other hemorrhages. The lesions are found in the spleen, lymph nodes, bone marrow, and liver. These organs show the presence of iron-containing pigment and large multinuclear cells with a characteristic cytoplasm. In the early cases, peculiar large phagocytic cells arise from atypical large lymphocytes which are found in the follicles (keimcentra) of the hemapoietic system. After leaving the follicles, these cells possess phagocytic qualities for a certain period. As a result of the phagocytosis, the cells are enlarged, the nature of the cytoplasm changes and the cells acquire a characteristic vacuolated and wrinkled appearance. The cells are carried from the spleen through the portal system to the liver, where they are destroyed. The irritation produced by this destructive process gives rise to an increase in the intralobular connective tissue. The disease is eminently a chronic one, without any of the manifestations of malignancy, and always terminating as the result of some intercurrent affection. The etiology is unknown, although a family predisposition to some toxin which causes an irritability of the follicles in the hemapoietic system probably exists. The probability of some protozoan affection as an etiological factor must not be overlooked.

There is a family reported by Reuben¹ in which four members were afflicted with splenomegaly of the Gaucher type. Both father and

¹ American Journal of Diseases of Children, January 3, 1912.

mother are living and healthy. The mother has borne four children, and has had no miscarriages and no stillbirths. The children are all healthy and well. The Wassermann reaction performed on the mother proved negative, and Reuben could get no history of either tuberculosis or syphilis in the family.

Polycythemia. Little advance has been made during the year in our knowledge of polycythemia, although some interesting observations have been made with regard to the character of the red cells in this disease.

The present terminology is objected to by v. Jaksch.¹ Polycythemia with cyanosis is an improper designation because the latter term carries with it the idea of an overloading of the blood with carbon dioxide, a condition which is not found in this disease. v. Jaksch thinks it more nearly proper to speak of a red coloring of the integument. Parkinson² also finds fault with the term polycythemia, because this might just as well indicate leukemic conditions, whereas this condition is one which is characterized by the increase of the red cells. He objects to the term splenomegalic polycythemia, and to chronic polycythemia with cyanosis, because, in this condition, the spleen is not always enlarged, nor is there invariably an associated cyanosis. Parkinson prefers the term *erythremia*. When the erythremia is cryptogenic, it may be termed *primary*. When it occurs as a consequence of congenital heart disease, chronic pulmonary disease, or other conditions known to produce an increase in the red cells, it may be called *secondary erythremia*. Many authorities use the term erythremia only when the disease is cryptogenic, and apply the term *erythrocytosis* to those cases which are clearly secondary. Objections to the terms splenomegalic polycythemia with cyanosis are also made by Hale White.³

[The reviewer, in 1896, suggested the term *erythrocytosis* as a general one, covering all types of cases, in the articles on Diseases of the Blood in the *Twentieth Century of Practice*.]

Steiger⁴ succeeded in producing polycythemia experimentally in men by the administration of different substances. The highest erythrocyte counts were induced through the use of opium, sulphur, phosphorus, pilocarpin, and arsenic. After the use of sodium nitrite, the number of red blood corpuscles increased from 4,950,000 to 5,920,000, and a transient glycosuria appeared. The change in the number of the erythrocytes cannot be caused by the action of these poisons on the vessels because the drug having the most pronounced action on the vessels (sodium nitrite) causes only a slight increase in the number of the red cells. The maximal effect of the other poisons was reached

¹ Zentralbl. f. inn. Med., April 27, 1912.

² Lancet, November 23, 1912.

³ Ibid., January 6, 1912.

⁴ Med. Klinik, 1912, No. 43.

after about eight days. In regard to the polycythemia, the author inclines to the view that these poisons, in small doses, inhibit the destruction of hemoglobin in the liver, alter the intermediate urobilin circulation, and lead to a slowly appearing polycythemia which disappears after a few days.

V. Jaksch¹ has studied a case of polycythemia under treatment with the *x-rays* with the view of ascertaining the *relations of the nitrogen-content of the whole blood and of the red cells*. He found that the whole blood was richer in nitrogen than normal, and that the variation in the nitrogen-content of the whole blood was dependent upon the number of the erythrocytes, the greater number of cells the higher the nitrogen-content, and *vice versa*. The red cells were found at the same time to be poorer in nitrogen than normal, and this poverty was inversely proportional to the number of red cells. The observation that a "hypo-albuminanemia rubra" is present in polycythemia is a counterpart of the relations of the red cells in pernicious anemia, when a decrease in cells is accompanied by a decrease in the nitrogen-content of the whole blood which is a normal relation. This observation may lead us nearer to the nature of polycythemia, for, taken in connection with the fact that no normoblasts were found, it leads us to believe we are not dealing with an increased formation of young cells. The size and the resistance of the red cells were normal, and regeneration forms were absent. Apparently, from these observations, von Jaksch says we are dealing with erythrocytes of lessened physiological worth, perhaps with old cells, therefore, cells which have escaped physiologic destruction, and in this circumstance the nature of Osler's disease may find its explanation.

Löwy² obtained the same findings as v. Jaksch in a case of polycythemia, but he found normal relations in the nitrogen content of the red cells and the whole blood in a second case. In view of these findings, he remarks that the erythrocytes in the first case are to be looked upon as of lessened physiologic worth.

Wakasugi,³ in a case which he investigated thoroughly, concluded, from the microscopic findings, that the polycythemia was due to an overgrowth of the erythroblastic bone marrow. He says the findings in this case, along with the findings in the cases previously reported, lead us to look upon overgrowth of the red bone marrow as the cause or origin of all cases of polycythemia with cyanosis and enlargement of the spleen. Nothing is known of the cause of this increased growth in the bone marrow.

W. Hale White⁴ objects to the term splenomegalic polycythemia with cyanosis because, as he points out, in 2 of the 3 cases which he reports there was no cyanosis, while in the other case it was the duski-

¹ Zentralbl. f. inn. Med., April 27, 1912.

³ Deutsch. med. Woch., 1912, No. 47.

² Med. Klin., 1912, No. 36.

⁴ Lancet, January 6, 1912.

ness of the skin which first attracted the patient's attention to his condition. The noteworthy points in White's case were that the splanchnic vessels were apparently greatly distended, for the patient had much indigestion, was frequently nauseated, and, at times, there was hematemesis. This, and the oozing of the blood from the gums, no doubt gave some temporary relief. The appearance of many little patches of dilated venules on various parts of the skin, and the dilated vessels of the conjunctivæ may also be regarded as evidence of the extreme distention of the veins, which was well shown on ophthalmoscopic examination. Judging by this case, the author thinks the condition should always be easy to recognize. He remarks that it would be interesting to know if the other two patients would become cyanotic later. In the first case, the urine contained a little albumin, a few casts, and a few red cells, this harmonizing with the hematemesis and oozing from the gums. These characteristics of the urine, the author points out, might easily lead to an incorrect diagnosis in this case before the blood was examined. The arteries, the heart, and the blood pressure, were normal, a remarkable fact considering the enormous volume of blood, which was three times greater than the normal. The red cells were double the normal per cubic millimeter which means that the patient had in his blood six times the normal number of red cells, and the total amount of hemoglobin was about four times the normal. The number of white cells per cubic millimeter was increased one-half (the increase, as usual, being in the polymorphonuclear cells, which formed 84 per cent. of the total leukocytes), so that the total increase of white cells was about four times the normal. Such blood must nearly have reached a volume and density which would render the circulation very difficult. The specific gravity was considerably above the normal, 1.076. Considering the very high oxygen capacity of the blood, the author believes that complete metabolism experiments extending over a long period should be carried out on a typical case of erythremia. It is noteworthy that, in cases 1 and 2 the patients lost weight, and in the third case, which was of a mild character, there was no opinion as to the weight. None of the patients were excessively hungry. The main point of interest about the second case was that there was extreme hypertrophy of an accessory spleen, combined with a moderate enlargement of the spleen. This gave rise to an abdominal tumor of such a shape that no one who saw the patient thought the tumor could be a spleen. The excessive oozing after operation indicated an overfull vascular system, but by no persuasion could the patient be gotten to submit to an examination of her blood in order to estimate the total quantity. The last count showed double the normal number of red cells and four times the number of white cells per cubic millimeter. Probably there was not any great increase in the volume of the blood in this case, for the patient was not cyanotic.

The third case was of the mild type. The splenic tumor here was larger than in either of the other two cases, yet the disease seemed to be progressing slowly, for the red cells were only 8,000,000 per cubic millimeter, and the white cells showed no increase. It is of interest to note, in this case, that an exploratory laparotomy had been performed, so presumably at some period of her illness there was doubt as to whether the abdominal tumor was a spleen.

Parkinson¹ has observed six cases of this condition at the London Hospital during the last six years. His first case was under observation three months. There was a florid appearance, with cyanosis and brownish pigmentation of the skin. The spleen was irregularly enlarged, heart enlarged to the left, and the arteries thickened. The blood pressure was 130; the erythrocytes were 10,900,000 per cubic millimeter. The urine showed the presence of albumin, there was gangrene of the tip of the penis, there was terminal ascites, with death eighteen months after the onset of symptoms. The second case was under observation for one year. The appearance was florid and cyanotic. The spleen was greatly enlarged, but later not palpable. The blood pressure was 115 to 135. The erythrocytes numbered 12,200,000. Severe increasing albuminuria was present; the patient had frequent attacks of perisplenitis, and death occurred one and one-half years after the onset of symptoms. The third case was under observation for four years. There was a history of continued exposure to gas; the appearance was extremely florid and cyanotic; the spleen was enlarged and the arteries thickened. The blood pressure registered 120; erythrocytes were 12,000,000 per cubic millimeter, albuminuria was present. The general condition of the patient remained good. The fourth case was under observation for five and one-half years; the face showed congestion and slight cyanosis. The spleen became palpable while under observation; the arteries were thick and tortuous; the blood pressure ranged from 124 to 130. The erythrocytes were 10,500,000 per cubic millimeter. The albuminuria was severe and increasing. Knee-jerks were absent. In this case, the size of the spleen was much reduced by venesection. The patient's general condition remained good. The fifth case was under observation for four and one-half years. The face was florid and cyanotic, and the skin showed pigmentation. The fingers were clubbed. The spleen varied greatly in size, sometimes enlarged, and at other times not palpable. The arteries were thickened, and the aorta showed dilatation (radiograph). The blood pressure was 120. The erythrocytes were 10,500,000. In this case there were attacks of epistaxis, hematemesis, purpura, and also profuse sweating. The patient was subject to mental changes. Death occurred from heart failure five years after the onset. The sixth case was under observation for one week. It gave a history of expo-

¹ *Lancet*, November 23, 1912.

sure to fumes. The face was a deep, bluish red, the spleen was enlarged, and the arteries thickened. Blood pressure was 170. The erythrocytes were 10,600,000. There was slight albuminuria. The patient's general condition was good after ten to twelve years of symptoms.

Hamilton and Morse¹ report a case with postmortem findings. The points of interest noted by the authors were the improvement in the condition under treatment with the *x*-ray. The decrease of the liver from very great size to about normal, apparently due to improvement but really due to degeneration. There were varicosities of the esophageal veins which are common in alcoholic cirrhosis of the liver, but, in this case, were unexpected, and an extraordinary fatal hemorrhage which was due to rupture of the esophageal vein.

Nothing new has been suggested in the *treatment of polycythemia* with cyanosis and enlargement of the spleen. Parkinson² calls attention to the fact that since most cases are treated in bed, at least for a time, the effect of this rest must not be ignored when the effect of other remedies is considered. *Venesection* provides the most certain means of relieving the symptoms, and, in some cases, this relief seems more than temporary. Thirty to forty ounces of blood, as recommended by Hutchinson, should be removed at a time and this procedure repeated as necessary throughout the course of the disease. The application of the *x*-rays to the bones over long periods of time has been followed by improvement in some cases. The inhalation of oxygen proved of no benefit to cases under his care. He considers splenectomy a dangerous measure.

Küttner³ also believes that repeated *venesection* is our most useful means of relief in polycythemia. The use of *diets* poor in iron, *inhalations of oxygen*, and the application of the *x*-rays to the spleen bring about no therapeutic result.

Discussing the treatment, Sunde⁴ says the *diet* should consist mainly of milk and vegetables, and should be otherwise regulated to ward off the tendency to apoplexy. He has observed no benefit from the use of the *x*-rays in this condition. *Venesection*, combined with saline infusion, brings about an insignificant reduction in the number of the red cells. Sunde withdraws from 300 to 750 c.c. of fluid at a time. Overexertion and the abuse of tobacco and alcohol must be carefully advised against. Iodine preparations, the author says, seem to reduce the viscosity of the blood.

POLYCYTHEMIA IN THE AGED. Hammer, Kirsch, and Schlesinger⁵ have found that in senility there is a distinct polycythemia, with an accompanying lowered color index. They investigated 155 old people

¹ Boston Medical and Surgical Journal, June 27, 1912.

² Lancet, November 23, 1912.

³ Berl. klin. Woch., 1912, No. 4.

⁴ Norsk Magazin for Lægevidenskaben, Sept., 1912.

⁵ Med. Klin., January 28, 1912.

of both sexes ranging from sixty to eighty-four years of age. They look upon this poverty of hemoglobin in the individual corpuscles as primary, and the polycythemia they consider a secondary compensatory process by which the aged organism is enabled to adequately free itself of carbon dioxide.

Hemorrhagic Disease. The literature of the year on the hemorrhagic diseases, in the main, has dealt with the treatment of these conditions. The most encouraging results have been obtained from the use of human whole blood as well as the serum. Regarding the pathogenesis of these conditions, Whipple¹ has made some interesting observations. In discussing Duke's work (see section on Blood Platelets), he says that one can make a reasonable objection to Duke's reports, as he has not followed the other elements of blood agglutination at the same time with his platelet counts. It could be argued with fairness that there could well be a fluctuation in some essential element, for example, kinase or thromboplastin, which could account, too, for the purpura and hemorrhagic symptoms. The investigators who choose to look upon these elements (the platelets) as the source of one of the coagulation factors, would surely raise this question and perhaps with justice. It is possible, however, that the agglutination of platelets in these ruptured vessels is essential to *effective* coagulation, and where we have too few platelets to form effective thrombi, the blood may clot, but is unable to seal the ends of the severed venules because of this lack of platelets. This is somewhat analogous to the condition in chloroform poisoning with very low fibrinogen when, also, the blood will clot *in vivo* or *in vitro*, but, owing to the lack of fibrinogen, the clots are very filmy and flabby, quite unable to stop the bleeding and seal the ruptured vessels.

Duke has been able to show that simultaneous reduction of platelets and fibrinogen, experimentally, is followed by purpura and prolonged bleeding from small wounds.

Whipple divides his paper into three parts: In the first part he reports a case of STAPHYLOCOCCUS SEPTICEMIA, and compares the blood findings in this case with those in a dog poisoned with Witte's peptone. In the case of the poisoned dog, a few minutes after the injection there was great weakening of the heart action, and the blood, after removal from the vessels, remained indefinitely without clotting and strongly inhibited the coagulation of normal plasma. Three hours after this observation, the animal was found dying, with signs of air-hunger. Blood removed from the auricle clotted spontaneously only after two or three days, and delayed the coagulation of normal plasma. Obviously, the second sample of blood contained less of the substance known as antithrombin than did the first specimen. Just before death, the animal was bleeding from the gums and from a superficial

¹ Archives of Internal Medicine, ix, No. 3.

skin wound. Autopsy showed splenic hemorrhages, and a peculiar diffuse hemorrhagic condition of the mucosa of the intestine with much fluid blood in the intestinal lumen. We might say that this animal presented some of the features of hemorrhagic disease. The human case furnished a blood picture very similar to that observed in the dog. Blood removed from the auricle clotted *in vitro* only after a period of one or two days; while in contact with the body tissues, it clotted in from ten to fifteen minutes, which is in harmony with the well-known fact that tissue juices will neutralize the antithrombin. Blood plasma from this case inhibited the coagulation of normal plasma following the addition of soluble calcium salts. Fibrinogen and calcium were present in normal amounts.

Autopsy showed a typical picture of pyemia or septicemia due to the staphylococcus aureus. The duration of the disease was four weeks. No purpura was present, nor were there any hemorrhages from the mucous membranes. Of course, it may be objected that this case showed no signs of hemorrhagic disease. It may likewise be objected that a dog shows no sign of hemorrhagic disease after an injection of peptone when we know the circulating blood is incoagulable for an hour or more after the injection. This condition usually passes off, due to a neutralization of the excess of antithrombin, but it may not always do so, as the author's experience has shown. The same experiment showed that after this condition has been present for several hours, the animal may develop hemorrhagic symptoms. One might argue, then, that the human patient had been suffering from an excess of antithrombin, but had not reached that stage where the signs of hemorrhagic disease (purpura and bleeding from the mucous membranes) appeared. From experimental data, we may assume that the liver is an essential factor in the production of antithrombin.

In the second part of Whipple's work, he reports a case of MELENA NEONATORUM, and discusses the findings post mortem, as well as the blood condition and experimental data on the same. He concludes, in this part, that it is pretty evident that a number of different conditions have been grouped under the heading "hemorrhagic disease of the newborn." The etiological factors are obviously various, and we may expect to find more or less variety in the blood picture. If we accept the theory of Lambert that in this disease there is a primary blood defect, a study of tissue from such a case might give us some hint as to the seat of production of the missing element. It seems clear that there was such a defect in this case at the time of death, and the organs were studied with the greatest care to determine any abnormality which could account for such defect being congenital. No such congenital defect was observed, but there had been a deposit of fibrin in the lung alveoli a few days previous to death, proving that, in this case, the defective element (prothrombin) had been present in the blood

or tissues at the time of birth. Hence, its absence from the blood at the time of death was not a congenital, but an acquired, abnormality. A study of this case offers no good anatomical evidence to explain the disappearance of one of the essential factors in blood coagulation—prothrombin. Thrombin injected into normal animals causes no intravascular clotting, but calls forth an excess of antithrombin which neutralizes the dangerous excess of thrombin at once. In normal blood, the prothrombin is present, but anchored by the normal antithrombin present in sufficient amount for this purpose. In this case of melena, it seems clear that the prothrombin is lacking, and this normal balance is absent. It may be said that the antithrombin is not bound, or exists unsatisfied. When serum (thrombin) is introduced, it is fair to suppose that a necessary part of the thrombin will enter into combination with the unsatisfied or unbound antithrombin normally present, and the excess of thrombin will be neutralized in the normal manner. Now the equilibrium of the blood, the normal balance of antithrombin and thrombin, is established so the circulating blood is in a position to react normally to an injury causing a production of thromboplastin. Injury to platelets or tissues can produce thromboplastin, which will neutralize antithrombin, thus setting free and permitting the prothrombin to combine with calcium, and clot the fibrinogen. The published reports of cases treated by blood transfusion or serum injection, together with the evidence submitted in this case, seemed to prove that certain cases of melæna neonatorum show a lack of one of the essential factors of blood coagulation, namely, prothrombin.

In the third portion of Whipple's paper, he describes a case of HEPATIC CIRRHOSIS, probably alcoholic in origin, WITH SPLENOMEGALY, HEMOCHROMATOSIS, PURPURA, AND HEPATIC INTOXICATION. Latterly there was bleeding from the gums. The case came to autopsy. The author describes and discusses the clinical and anatomical findings, together with the experimental data on the blood, and, in conjunction with this, describes the results of chloroform poisoning in a dog, with discussion of the findings. He says a dog severely poisoned by chloroform anesthesia presents a characteristic clinical picture—icterus, bleeding from the gums, prolonged oozing from skin pricks and cuts, a bleeding-time so prolonged that it cannot be estimated, and obvious toxemia. Such animals may develop purpura and have gastric, intestinal or peritoneal hemorrhage. The essential anatomical change is an extensive central liver necrosis. The blood shows an extreme drop in its fibrinogen content, and the other factors of the blood coagulation are normal. The purpura and bleeding, then, must depend on this great diminution in fibrinogen, for the blood clots are too soft and tenuous to stop even capillary oozing.

Cases of hepatic cirrhosis may show more or less purpura, oozing

from the gums, gastric or intestinal hemorrhage, and delayed bleeding-time, particularly when suffering from the so-called "hepatic toxemia." Here we are dealing with a relatively slowly developing hepatic insufficiency, while in the animal experiments there is an acute liver injury, with more or less insufficiency. Yet the clinical pictures have many points in common. Blood from the cirrhosis cases shows a very low fibrinogen fraction, but other elements of coagulation are normal, as in the dog experiments.

The hemorrhagic symptoms in this group are surely referable to this drop in blood fibrinogen and dependent on it alone. The blood clots in the normal time, but the clots are too soft to close the ruptured vessels, and bleeding continues. This observation is of interest in connection with one explanation of "purpura" as referable to increased fragility or delicacy of capillaries. We cannot imagine any such fluctuation in capillary fragility in this condition (acute or chronic), yet just as soon as the blood fibrinogen drops below a certain level we may observe purpuric spots. It is obvious that after trauma we may have a subcutaneous extravasation of more or less blood in a normal person. It is quite possible that *slight* bruises may rupture a few capillaries which would give rise to no visible extravasation in normal persons, but could be associated with much blood extravasation in these cases in which the blood clots are too soft to close the broken vessels. This is surely a possible explanation for the purpuric spots observed in these cases, and may be applicable to other hemorrhagic diseases in which other elements of coagulation are abnormal.

Observations on dogs suffering from acute liver injury (chloroform) with hepatic insufficiency, and parallel observations on human cases of cirrhosis with progressive hepatic insufficiency prove beyond any doubt that the liver is an essential factor in maintaining the normal fibrinogen balance of the blood. It is possible that the fibrinogen is elaborated by the liver, but more evidence must be submitted to establish this point.

At present, it is difficult or impossible to get an accurate estimate of liver efficiency, but it is possible that the fibrinogen curve may prove of some value in diagnosing a true hepatic insufficiency, resulting from either acute intoxication or chronic progressive degeneration. The accurate determination of blood fibrinogen is not suitable for clinical purposes, but, in cases with very low fibrinogen, this fact is obvious from examination of the blood clots in a small test-tube. Better still, a little oxalated plasma can be obtained and clotted by means of calcium salts, giving a pure clot without blood cells, from which a rough estimation of fibrinogen is possible.

Pick¹ reports an EPIDEMIC OF THE HEMORRHAGIC DIATHESIS in the region of Saaz. Thirty-four cases occurred from March until the

¹ Münch. med. Woch., December 24, 1912

middle of June, 1912. They were distributed over a small area, including 9 cases in the city of Saaz; 12 in the city of Postelberg; and 13 in 11 other places. The epidemic affected 33 men and 1 woman. The woman was aged over seventy years, and the ages of the men ranged from fifteen to over seventy years. In the majority of the cases, the hemorrhages appeared first in the lower extremities. In the upper extremities, they were unusual and slight and superficial. The anemic and cachectic appearance characteristic of scorbutus was not present in the young and middle-aged of this epidemic. The old patients, over sixty years of age, were pale, and of a distinctly sickly appearance. In many of the patients, hard, painful swellings could be made out in some of the muscles. In others, there was an infiltration along the tibia. These findings strongly remind one of the blood extravasations in Barlow's disease. Microscopically, the blood showed nothing of importance. No bacteria were found. The coagulability of the blood showed no pathological change. The disease was probably due to an unvaried diet. Nearly all the patients for several months before the appearance of the hemorrhages had existed on a diet of coffee, bread, meat, especially sausage, cheese, and beer. Potatoes and other vegetables were not eaten because in the previous year the crops had been poor and these articles were costly. The diet was not poor, but it was one-sided compared with the diet of previous years. After the middle of June, no cases appeared. About this time potatoes, fresh vegetables, and fruit were easily obtainable and cheap. The author says that the designation of the disease as hemorrhagic diathesis is only a general term, and suggests calling it *angiorrhexis alimentaria*.

Ernst¹ reports what he believes to have been an epidemic of PURPURA. From the end of August, 1909, through the months of September, October, November, and December until the end of January, 1910, there appeared so many cases of purpuric disease that he was led to the impression that an epidemic existed. This impression was strengthened by the fact that many of the cases occurred in single isolated families, among sisters, and parents, and children. Especially interesting was a case in which the patient had come from a distance and was the guest of a family where purpura existed. A few days after arrival, the guest was taken with purpura. The author says that in ten years in this region no similar occurrence could be recorded. It is remarkable that from the end of August until the end of October there was a rapid increase or rise in the incidence of cases. Then a rapid fall during November, with a slight rise during December, and another fall in January. The curve went from 0 in August to 8 in September, 20 in October, to 6 in November, to 8 in December, to 4 in January. He thinks, in the face of this evidence, one is justified in

¹ Med. Klin., Berlin, August 4, 1912, viii, No. 31.

concluding, in spite of the absence of bacteriological findings, that this was an epidemic with an infectious cause.

Edgeworth¹ refers to the work of Bensaude and Revet, in 1905, on CHRONIC PURPURA, and then reports 4 interesting cases to illustrate this condition. The first case was admitted to the hospital suffering from pains in the stomach and limbs, and bleeding from the mouth. There was no family history of bleeding. Fourteen years previously she had had bleeding from the mouth, and a purpuric rash on the skin. Since that time she averaged about one attack a year. These attacks occurred at intervals during the five years after Edgeworth saw her, and then ceased. The disease thus lasted for nineteen years.

The second case was that of a boy, aged seventeen years, who was suffering from pneumonia of four days' duration. There was no previous illness of any note. No history of bleeding. Seven days after admission there was vomiting and pains in the cervical region of the spine, with contraction of the flexors at the elbow-joints. On the twentieth day after admission, a purpuric rash appeared on the legs and thighs. There was some localized tenderness, but no swelling at the lower end of the right thigh. No leukocytosis. On the twenty-second day there was some abdominal pain and vomiting, with smoky urine containing red blood corpuscles. No casts. The boy was well during the following year and was then taken with an attack of bronchitis. Seven days after this, an eruption, partly purpuric, appeared on the legs and thighs, and there was a second crop nine days afterward. A month afterward he passed blood in the urine, but no casts were found. For the past six years there has been no recurrence.

The third case occurred in a man, aged fifty-three years, who was admitted to the hospital suffering from purpura. Three weeks previously he had caught cold, and one week afterward spots came out over the body. The bleeding was apparently confined to the skin. There was nothing of note in the blood count, but a blood culture taken the day after admission showed the presence of pneumococci. About seven months after this initial attack he was again taken with purpura, the legs only being affected. The bacterial content, if any, of the blood was not determined.

The fourth case was that of a girl, aged eighteen years, who was admitted suffering from a painless but profuse hematuria, which had begun suddenly without any known cause a few days previously. There was no family or previous history of bleeding. She had always been healthy. The urine was normal in amount, passed at usual intervals, and was intimately mixed with blood. No casts were found. The right kidney was slightly movable and somewhat tender. The blood in the urine was found to be inconstant and variable in amount.

¹ British Medical Journal, March 30, 1912, i, No. 2674.

Three months afterward the patient vomited, and the material was streaked with blood. Nephropexy was performed a little while after this, and the kidney was found to be perfectly normal. The bladder revealed no abnormality and in no way could the hematuria be accounted for. It gradually disappeared about eight or nine months after its appearance. She had a number of slight recurrent attacks about a year after the original onset. A year and ten months after the original onset, an acute hemorrhagic crisis occurred. Bleeding from the rectum, as well as hematuria, appeared. Four years after the original onset there was another hemorrhagic crisis in which she passed blood per rectum, and hematemesis and hematuria were present. There has been no recurrence during the last three years. The author remarks that chronic purpura, of the Henoch type, is not common, but that cases of a purely hemorrhagic variety, such as he records, are probably still rarer. He considers their recognition of importance, for it seems possible that, in some cases, at least, a cure can be wrought.

A case of **FULMINATING PURPURA FOLLOWING SCARLET FEVER** is reported by McCririck.¹ The patient was a boy, aged five years, who was admitted to the hospital on December 12, 1911, in the desquamating stage of scarlet fever. On December 17, however, he vomited some greenish fluid just before dinner, and did not seem very well in the afternoon. During the night his sleep was fitful. About 4 A.M. on December 18, a dark-colored mark, like a bruise, showed itself on the left buttock, and others soon appeared on the left thigh and leg, and later on the leg and thigh of the right side. By 9 A.M. the boy looked ill, and his face and lips had become quite pallid. The pulse rate had risen to 140 and the respirations were 28. The left buttock and lower limbs now presented several ecchymotic areas of a dark purplish color, the advancing edges being reddish-black and sharply demarcated. The areas were raised above the surrounding skin, felt warm, and imparted a sense of want of elasticity to the palpating fingers. There was no paresthesia or hyperesthesia. The larger areas developed in rings with a central area of apparently healthy skin, which gradually became encroached upon, till ultimately, at 7 P.M., the whole presented one great black patch. Four hours later the patches had not increased in size, but the skin of the unaffected parts of the body had become very pallid, with the yellow tint and the waxy hue of grave anemia. The left foot and leg were now considerably swollen, and the pulse had become very feeble. During the night the patient was very restless, although the mind remained clear to the end, which occurred at 5 A.M. next morning, twenty-five hours after the first appearance of the ecchymoses. On the 18th, the urine, hitherto clear, contained a cloud of albumin, but no blood, and no blood appeared from any of the other mucous surfaces.

¹ British Journal of Children's Diseases, April, 1912.

Cultures on agar and in broth from the heart chambers and from the ecchymotic tissue remained sterile.

Throat cultures contained no diphtheria bacilli. Microscopic sections of the liver and kidney showed nothing abnormal.

The blood count made ten hours after the appearance of the ecchymoses revealed the following: Hemoglobin, 65 per cent.; red cells, 3,670,000; numerous microcytes, slight poikilocytosis, no normoblasts; white cells, 15,700. Differential count: Polymorphonuclears, 86 per cent.; small lymphocytes, 7 per cent.; large mononuclears, 4 per cent.; eosinophiles, 5 per cent.; myelocytes, 2.5 per cent.; mast cells, 0. The blood platelets were not increased. Of 64 cases of purpura fulminans published up to the present, including a case recently recorded by Elliott and Martland, and one by Weill and Mouriquand, 17 have followed scarlet fever, the ecchymoses occurring usually in the second, third, or fourth weeks of the disease.

Eichhorst¹ discusses HEMORRHAGIC PURPURA WITH INVOLVEMENT OF THE KIDNEYS, and reports 3 cases illustrating the condition. From his observations, the author believes that the nephritic involvement is more liable to occur in cases which run a chronic course and show a tendency to recurring extravasations of blood under the skin. The nephritis may be either of the interstitial or parenchymatous varieties. They are both extremely refractory to treatment, yet they seem to display no influence on the myocardium or pulse, and do not entail debility or uremia. In spite of the prognosis being dubious as to ultimate recovery, the nephritis need not be regarded very seriously. In his cases, the symptoms of nephritis have been persistent, but the general condition of the patients has remained good.

Cruice² has written on the INCIDENCE OF PURPURA IN THE COURSE OF CHRONIC PULMONARY TUBERCULOSIS, and reports 8 cases coming under his observation. Bensaude and Rivet concluded that purpura is frequently associated with tuberculosis. Seven of their 35 cases occurred in individuals undoubtedly tuberculous, and 5 in individuals probably tuberculous. The occurrence of purpura, especially the hemorrhagic form, in the course of tuberculosis, is always a grave symptom. It either marks the terminal or cachectic stage of the disease, or an acute exacerbation of the tuberculosis which may go on to a rapidly fatal termination or from which the patient may recover; but always, after the attack of purpura, the examination will reveal a more advanced condition of the tubercular lesion. All of Cruice's 8 cases occurred in the terminal stage of chronic pulmonary tuberculosis. Case 1 was an undoubted purpura hæmorrhagica, and occurred only five days before death. Case 2 the author believed to be a simple purpura, although there was hematuria, and, at one time, bloody

¹ Med. Klin., January 7, 1912.

² American Journal of the Medical Sciences, December, 1912.

stools accompanying a diarrhea. The hematuria was accounted for by the tuberculosis of the kidney, ureter, and bladder. Cases 3, 4, 5, and 6 were instances of simple or cachectic purpura, and the last three were observed postmortem. Case 7 was what Osler calls a mechanical purpura, being caused by a venous stasis through thrombosis of the internal saphenous vein. Case 8 might be either a simple purpura complicating the tuberculosis, or a toxic purpura complicating the intense jaundice which was present. However, whether a simple or a toxic purpura, it was a purpura occurring at the termination of chronic pulmonary tuberculosis complicated by a most unusual form of caseous tubercles of the liver.

TREATMENT. The treatment of hemorrhagic disease with biological products, especially *human blood*, has been enthusiastically reported through the year. In some instances, the use of the whole blood has been resorted to. In the majority of instances, human serum has been used, sometimes defibrinated blood. Some have made use of the tissue juices, and others have used horse serum. Success attended the use of these substances almost invariably.

Schloss and Commiskey¹ have used *subcutaneous injections of whole blood* in the treatment of hemorrhagic disease in the newborn. They have found it harmless and of apparent value. The procedure is simple, and, in their series of nine cases, it has proved efficacious. The injected blood is quickly absorbed and apparently without harmful influence on the patient. Two cases which they treated in this manner terminated fatally. In 1 of these it was impossible to determine whether the outcome was due to hemorrhage or some other cause, as there was practically no external bleeding. The other patient was moribund when treatment was instituted, and died three and one-half hours after admission to the hospital. The best results are obtained, according to the authors, from the injection of 10 to 30 c.c. of blood repeated every four to eight hours as long as the bleeding continues. The authors scarcely expect that such a therapeutic measure will prove a cure in all cases. Apparently, there are a number of different conditions which may be responsible for hemorrhage in the newborn, and there is no indication that the pathologic condition of the blood is always the same. They have found that the coagulation of the blood may be normal, delayed, or absent. A deficiency or absence of thrombin or fibrinogen may give rise to imperfect blood coagulation and uncontrollable hemorrhage. In some cases, hemorrhage in the newborn, in which the blood coagulation is apparently normal, is probably due to some localized vascular lesion or defect present only in the area from which the bleeding occurs. In those cases in which the hemorrhage is profuse and which, as a rule, prove quickly fatal, it seems

¹ American Journal of Diseases of Children, April, 1912.

scarcely possible that any of the simpler measures could be of value. Immediate transfusion of human blood is probably the only means from which any result could be expected.

Schloessmann¹ discusses the futility of attempting to influence the coagulability of the blood by the direct administration of any normal ingredient of the blood. Biological measures seem to be the only possible means. He cites the case of a hemophilic, who was bleeding freely from a small wound at the corner of the mouth, in which he resorted to kneading and squeezing the tissues around the wound in order to express the tissue juices, hoping thus to supply thrombokinase to the hemophilic blood. The result was an instantaneous success. The hemorrhage recurred two or three times subsequently, and, on each occasion, was arrested by squeezing the tissues around the wound. This case suggested to Schloessman the idea of using tissue extracts systematically in the treatment of hemophilic bleeding. He has had a great deal of fresh goitre material at his disposal, and has been using it for the purpose. He uses only the parenchymatous hyperplastic glands and discards the cystic or colloid goitres. He recommends this means as the most effectual yet known to control hemophilic hemorrhage by local application. It is absolutely harmless. The material is easily sterilized, and retains its properties for a long time. Its internal administration, or its use subcutaneously or intravenously has proved disappointing and was frequently accompanied by untoward effects. In the use of the tissue extract, he places the bleeding point of the hemophilic in such a position that the extract can stand on it for five or ten minutes, and he refrains from tampering with it. He has never used this treatment in a serious hemophilic hemorrhage, but says that he would approach such a case with confidence.

Oliver² has used *horse serum* with good results. He has found that little, if any, benefit attends the use of the older remedies, such as the rectal injection of epinephrin, ergot, hamamelis, calcium salts, etc. He cites the case of a hemophilic boy, aged five years, who had been bleeding from a wound in the lower lip for nearly forty-eight hours. The hemorrhage was rapidly and permanently arrested by the rectal injection of horse serum. In other cases he obtained equally good results.

Reuben³ has made use of *defibrinated blood* in the treatment of hemorrhagic disease. He reports the case of a woman, aged fifty years, with a hemorrhagic diathesis who suffered from severe climacteric hemorrhages and extravasations of blood. The mucous membrane of the mouth, the tongue, and the pharynx was also involved. The slightest movement of the tongue brought on severe bleeding. The urine showed traces of blood. The hemoglobin was 50 per cent. (Sahli). The condi-

¹ Beitr. z. klin. Chir., August, 1912.

² Practitioner, June, 1912.

³ Münch. med. Woch., October 1, 1912.

tion of the patient had been rapidly growing worse, and Reuben obtained blood from the patient's daughter and, after defibrination, injected 40 c.c. intramuscularly. All of the hemorrhages were rapidly arrested. On the second and fourth days following the injection, similar injections were given. There has been no tendency since to a return of the hemorrhages. The author remarks especially upon the rapid resorption of the blood extravasations, although he is not certain that this rapidity of absorption was dependent upon the injections. His observations have also made him think that the injections of defibrinated blood might be of great use in gynecological affections accompanied by severe bleeding.

Sayer¹ reports the case of a boy, aged thirteen years, of Danish parentage, with a hemophilic history, who, two days before Sayer's visit, had been struck above the right eyebrow by a pump-handle. The extravasated blood gravitated to the upper eyelid and formed a tumescence which projected at least 1 inch from the forehead. This burst while the boy was in school, and Sayer saw the case twenty-four hours later. He found, projecting from the eyebrow, a hollow cone formed of blood which had slowly coagulated, and from the end of which blood was falling at the rate of one drop per second. He removed the cone, cleansed the part, and applied the usual remedies without result. He again cleansed the wound, which was three-eighths of an inch long, and applied a hot compress with considerable pressure. Making an incision in the third finger of his left hand under sterile conditions, and removing the compress, he allowed his own blood to drop on the wound. A clot formed immediately and not one drop of blood again escaped. Thirty-six hours later the patient in his sleep tore away the dressing and reopened the wound. Sayer was again called and found the hemorrhage as profuse as in the beginning. He again made use of his own blood in the same manner, with the same instantaneous result.

Traver² has used the subcutaneous injection of *human blood serum* in a case of hemophilia with immediately good results. The case was that of a boy, aged five years, with a hemophilic family history, as well as a previous history of frequent and severe bleeding. Traver saw the boy six days after he had received a slight painful cut of the tongue which had been bleeding freely throughout that period in spite of the use of the usual remedies, including several injections of horse serum. When seen, the child was very pale, the pulse was scarcely palpable, and the case looked hopeless. Blood was obtained from the father and placed in the ice-box for ten hours. Twenty cubic centimeters of the serum were then injected subcutaneously into the child's buttock. Within twenty minutes there was a firm clot forming on the tongue.

¹ Journal of American Medical Association, January 13, 1912.

² Ibid., January 4, 1912.

This gradually increased in size until it became difficult for the child to close his mouth, when the clot was removed with much apprehension. However, upon removal the hemorrhage had ceased and did not reappear. There was only slight bleeding after the first injection; yet a second injection was given eight hours later and a third sixteen hours after the first.

A case of *MELÆNA NEONATORUM* developing in the characteristic manner on the fourth day after birth is reported by Nicholson.¹ The case appeared severe and hopeless. As a last resort, Nicholson obtained serum from the father's blood and injected a little more than 20 c.c. into the tissues of the back. On the following day, 18 c.c. were injected in the morning, and 10 c.c. at night. On the next day there was some vaginal bleeding, but only 6 c.c. were injected, as the supply was temporarily low. On the following day, the cord separated in a perfectly normal manner. There had been no bleeding externally during the night, but the neck was discolored and swollen. Two doses were given on this day, the morning measuring 18 c.c., and the evening 14 c.c. Upon this same day a small swelling, which the author believed to be a cephalhematoma, made its appearance. The next day the first normal stool was passed. The baby was evidently improving, and but 6 c.c. of the serum were administered. A supply was kept in readiness for a couple of days, but was not used as the child was free from any sign of active bleeding and the hematoma was decreasing in size. The weight was also increasing, and the temperature remained normal. Nicholson says he has had the pleasure of seeing this child recently, and that she is a large, healthy girl, presenting no evidence of the severe illness just recorded.

Wilson² has used the injection of human blood serum with success in a case of Henoch's purpura in a boy, aged nine years. The condition was growing worse and the case was considered hopeless, when the idea of treating it by the subcutaneous injection of human blood serum occurred to them. Fifteen ounces of blood were drawn from the patient's father, and the serum from this used in the treatment of the case. Three injections of this serum were given; the first two of 45 c.c., and the third of 72 c.c. Another portion of blood was drawn from the father's arm, and the serum from this injected subcutaneously in two doses of 90 c.c. each. The first injection was given on the fourth day after admission to the hospital, and the last injection on the eighth day. Hence, the interval between doses must have been slight, although the author does not state it. The patient from the time of the first injection began to show improvement, and this improvement was marked after the fifth injection and continued from then until the discharge of the patient.

¹ *Therapeutic Gazette*, February, 1912.

² *Medical Record*, August 10, 1912.

Hemolytic Jaundice. Pearce and his co-workers have gleaned some valuable and interesting facts in regard to hemolytic jaundice from their experiments with splenectomized animals. Pearce, Austin, and Krumbhaar¹ found that rapid injection of more than 0.06 gram per kilo of hemoglobin intravenously into a normal animal is followed by the appearance of hemoglobin in the urine (pelvis of kidney) within eight to ten minutes. After rapid injection of more than 0.012 gram per kilo per minute of hemoglobin, 16 to 36 per cent. of the total amount, if this equals 0.25 gram per kilo, is eliminated in the urine and is accompanied by choluria. If the injection of not more than 0.35 gram per kilo is made slowly (less than 0.01 gram per kilo per minute), the amount eliminated in the urine is only 2.33 to 9.5 per cent. of the total amount injected, and choluria does not occur. The concentration of free hemoglobin in the blood, which constitutes the threshold value of the kidneys for hemoglobin, is approximately 0.06 gram of hemoglobin per kilo of body weight. When about this concentration is reached, hemoglobin appears in the urine. The amount of hemoglobin per kilo of body weight which, after rapid injection, may be retained without jaundice, is approximately 0.18 gram. When 0.22 or 0.23 gram is retained, bile pigments appear in the urine. The threshold of the liver for jaundice, in point of hemoglobin saturation, lies, therefore, between 0.18 and 0.22 gram per kilo of body weight. With slow injections, a greater amount may be retained without choluria.

The absence of the spleen does not alter greatly the percentage of hemoglobin eliminated by the kidney, nor does it raise the threshold of the liver for jaundice. In the presence of jaundice, either hemolytic or obstructive, the amount of hemoglobin retained by splenectomized animals is slightly diminished, and that eliminated by the kidneys is correspondingly increased.

On these data the authors base the following explanation of the mechanism by which free hemoglobin is removed from the blood serum. Hemoglobin is not removed by the kidney until its concentration in the blood serum reaches a certain level (0.06 gram of free hemoglobin per kilo of body weight). This constitutes the threshold value of the kidneys for hemoglobin, and when it is reached, hemoglobin appears in the urine. When the concentration is lower, hemoglobinuria ceases; at the same time, however, the liver, and possibly other tissues, take up hemoglobin as soon as mere traces are present in the serum and they continue this removal whether the renal threshold is exceeded or not. The two processes go on simultaneously, the rate of removal, when the renal threshold is exceeded, being for the kidneys, 17 to 36 per cent., and for the liver and other tissues, 64 to 83 per cent. of the total amount introduced. The hemoglobin which is removed by the

¹ Journal of Experimental Medicine, September, 1912.

liver is transformed into bile pigments. If the amount reaching the liver is small and is received slowly, the amount of bile formed is not increased above the excretory capacity of the liver, and it is removed by the bile passages without the occurrence of choluria. This is shown in their experiments in which injections of hemoglobin were made more slowly than 0.01 gram per kilo per minute. On the other hand, if the hemoglobin is taken up by the liver rapidly and in large amounts, the bile capillaries are overtaxed and the bile cannot be rapidly removed, but is re-absorbed into the blood, and choluria develops. If this theory be correct, it affords an explanation of those instances of blood destruction in man characterized by jaundice, but not accompanied by hemoglobinuria. In a slow, gradual destruction of red cells, the liver removes the hemoglobin from the serum so rapidly that the concentration of hemoglobin in the serum does not reach the threshold value of the kidneys and hemoglobinuria therefore cannot occur. The constant absorption of large amounts of hemoglobin by the liver, and the increase in bile formation which results, does, however, overtax the bile passages and jaundice occurs. In the same way may be explained the continuance of jaundice after the disappearance of a transient hemoglobinuria.

Pearce, Austin, and Musser, Jr.,¹ from their experiments, arrive at the following conclusions:

1. The failure of a hemolytic serum to cause jaundice is due in some way to the anemia which frequently follows splenectomy. Animals, whether splenectomized or not, which have a low blood count and low hemoglobin content, do not readily develop jaundice after the administration of a hemolytic serum. On the other hand, in animals with a normal blood count, such a serum readily causes a well-marked jaundice during the early periods after splenectomy.

2. The difficulty of producing hemoglobinemia and jaundice in animals splenectomized one month or more, is due, as shown by the blood count, to the use of the hypotonic salt solution test, and, by search for the presence of hemoglobin in the serum and urine, to an increase in the resistance of the red cells.

3. It is possible that spontaneous jaundice, occurring at long periods after splenectomy, is an accompaniment of complete regeneration of the blood. The study of the blood in animals splenectomized for long periods, seven to ten months, indicates that spontaneous jaundice occurs only when the animal has recovered from the initial period of anemia and has a high cell count and high hemoglobin content.

4. As to the mechanism responsible for the anemia following splenectomy and for the increased resistance of the red cells, the authors offer no explanation.

¹ Journal of Experimental Medicine, December, 1912.

Scurvy. The reports of considerable interesting experimental work on scurvy have appeared in the literature during the past year. Hart's¹ work is worthy of special notice. In his experiments on the relation of Barlow's disease to scurvy in the adult, he used 10 young monkeys which had not attained full growth. These animals were kept carefully under the proper conditions for the experiments, and fed on condensed milk exclusively. In addition, control animals were kept under the same conditions and fed on a suitable mixed diet. Nine of these experimental monkeys died of typical Barlow's disease, while the tenth developed a severe rachitis. Bleeding of the gums was the first symptom observed in all the cases. In later stages, the molar teeth became loose, but did not fall out. Ulcerative stomatitis did not develop in any of the cases. Skin hemorrhages were not observed. Hemorrhagic swellings often developed in the regions of the knee-joints or of the joints of the hands or feet, and also in the cranium. The swelling developed with great pain, and disappeared slowly. Later, the animals sat with drawn-up extremities. In one monkey, a *Cebus capucinus*, a very large swelling developed on the forehead. In another, a *Macacus*, the swelling involved the entire top of the cranium, extending from the eyebrows back to the occiput. These severe hemorrhages could be demonstrated postmortem. Finally, an exophthalmos would develop, with an edematous hemorrhagic swelling of the upper eyelid which usually disappeared rather rapidly. An abnormal crepitation in the regions of the shoulder, knee, and joints of the hand showed the presence of fractures. Bloody diarrhea occurred often. The findings postmortem were always of the same kind, showing only slight differences. The two principal findings were more or less widely spread hemorrhages in the soft parts, and subperiosteal hemorrhages with fractures of the long bones, always in the region of the epiphyses. These subperiosteal hemorrhages were always present at the junctions of the costal cartilages with the ribs. They were likewise present in the clavicles, the cranium, and the shoulder-blades. The hemorrhages into the soft parts were not only intramuscular but also occurred in the gums, the intestinal mucous membrane, the lungs, and the kidneys. Hematuria, although not observed, undoubtedly occurred in some of the animals.

The author also made use of an old monkey, keeping him under the same conditions as the young ones, and feeding him on condensed milk exclusively. This monkey developed severe ulcerative stomatitis, which resulted in the loss of all the incisor teeth. The animal became cachectic and died. Subperiosteal hemorrhages were found in the regions of the epiphyses which, however, on section, showed complete obliteration and ossification. These hemorrhages were also found at the junctions of the ribs with their cartilages. There was also a considerable hemor-

¹ Virchow's Archiv, June, 1912.

rhage between the dura mater and the frontal bone. The findings in this animal macroscopically and microscopically showed practically exactly the same changes as those which occurred in the young animals. The author asks whether we shall designate the disease of the former scorbutus, and that of the latter, Barlow's disease. He says that he has been fortunate enough to prove for the first time that the same bone changes appear in the scurvy of adults as in Barlow's disease, and that this is conclusive proof that the affections are identical. Instead of using the term "Barlow's disease," we should use only the term "infantile scurvy." From his researches, he has gotten the general impression that an individual disposition plays an important part in the origin of infantile scurvy, for, of the 10 monkeys which he had under observation for nearly a year, some developed the disease early and in a severe form, while others were taken later and appeared, throughout the course of the disease, to be more resistant.

Holst and Frölich,¹ through elaborate series of experiments, have studied the condition of experimental scorbutus. They found that guinea-pigs, which had been fed exclusively on different kinds of grain or with bread, developed, in the course of about a month, a disease which pathologically corresponds to human scurvy in all important particulars. There was looseness of the teeth, with hyperemia of the gums in which hemorrhage could always be demonstrated microscopically. Ulceration of the gums occurred only exceptionally. As in human scurvy, there often occurred hemorrhages in the regions of the junctions of the ribs with their cartilages and in the surrounding soft parts. Hemorrhages also occurred frequently in the soft parts of the extremities, especially in the region of the knee. Likewise, as in the human form of the disease, solution of the epiphyses of the long bones, especially the upper epiphysis of the tibia was often observed. The characteristic microscopic changes of the bone marrow which occur in infantile scorbutus were almost constant in the guinea-pigs suffering from this disease. Hemorrhages into the skin seldom occurred. In control animals which were fed exclusively on white cabbage, carrots, or dandelion, the disease did not present. The experimental disease could be cured by the use of raw antiscorbutic vegetables. These vegetables were found to lose their antiscorbutic effect by subjecting them to different conditions, such as drying and cooking at 110° to 120°. The fresh juice of white cabbage lost its antiscorbutic effect if heated to 60° or 70° for ten minutes, while such treatment had no appreciable effect on the white cabbage leaves.

The cause of scorbutus, according to the authors, is to be sought in nourishment which lacks, or contains in insufficient amount, certain chemical substances whose nature is unknown. There is not one, but many of these substances. This is proved by the fact that while

¹ *Zeitschr. f. Hygiene*, 1912, lxxii.

drying destroys the action of some, it has no effect on others. While some resist certain temperatures, others are destroyed by the same temperatures. The authors were able to produce scorbutic changes in two dogs by feeding them for a long while with oatmeal cooked with water and beef mesentery. They have likewise produced the disease in swine by feeding them on rye bread and cooked beef, or on rice and cooked dried fish. In the majority of animals, a distinct polyneuritis was developed in addition to the scorbutic changes.

Fürst¹ has investigated the etiology of experimental scurvy in the guinea-pig, and, after experiments on 157 pigs, his findings led him to practically the same conclusions as those of Holtst and Frölich. He says that one receives unwillingly the impression that we have here to deal with a series of antiscorbutic substances with different characteristics which, however, possess a common nucleus or essence (Kern) which in its action is the antiscorbutic agent, in the same sense that iron is the active agent in all of the various anti-anemic substances.

Baumann and Howard² have studied the *metabolism of scurvy in an adult*. Their conclusions are that as this is the first accurate study of the metabolism of scurvy it would be hazardous to venture any conclusion from their figures. In their experiment, the loss of the various food constituents through the feces was less when the fruit juice was added to the diet. The total sulphur metabolism was abnormal throughout. Chlorine and sodium were retained during the fruit-juice period, but excreted in excess of the intake during the preliminary period. More potassium, calcium, and magnesium were retained during the fruit-juice period.

The metabolism of infantile scurvy has been investigated by Lust and Klocman³ in a child, aged eighteen months. The study was divided into three periods of four days each. The first period was during the time when the disease was at its worst, and the child was receiving no treatment. The second period was after a month's treatment, and the third period a month later when all the symptoms had disappeared. The nitrogen balance was found to be normal all the time. During the first period, the balance of mineral salts, especially calcium, was somewhat increased. During the second period, while the child was convalescent, there was a marked decrease. In the third period, when the child was clinically well, the balance of mineral salts approached normal, although this point had not been reached. This is contrary to the condition found in rickets. The increased amount of retained salts is used in the formation of bone, and we have in consequence the brittle, fragile, easily broken bones of scurvy in contrast to the soft and pliable bones of rachitis. This excess of salts is eliminated in

¹ Zeitschr. f. Hygiene, 1912, vol. lxxii.

² Archives of Internal Medicine, June, 1912.

³ Jahrbuch f. Kinderheilkunde, June, 1912.

large quantities during the period of convalescence, and the bones gradually approach their normal condition, but for weeks, and sometimes months, after the clinical recovery, traces of the abnormal bone formation are revealed by the *x*-ray.

Northrup¹ reports a case of infantile scurvy in a child which had been fed on Loefflend's malt soup for seven consecutive months. The child was nursed at the breast for three months, for some reason then weaned, and for the following seven months was on the above diet without interruption. On admission, the child showed paralysis of one leg and diffuse swelling of the right leg more pronounced than in the left. There was a black and blue spot on the inner aspect of the right ankle. The legs were flexed, immovable, and exquisitely sensitive to the touch. The child could not move even the toes of the right foot. The arms were freely movable and not painful. The gums were spongy. There was swelling, with congestion, about three teeth on the upper row and about one incisor on the lower. The teeth of the upper row were almost, but not quite, through. In addition to the above, the child showed a slight hemorrhage into the upper lid of the left eye, and this was later followed by a similar condition on the right side. The case was treated by putting it on a fresh milk modified with barley water, and the administration of orange juice in ascending doses twice daily. The pain began to subside in three to five days, and in two weeks the child was able to freely move one leg, and at the end of a month was free of all pain and moving both legs equally. It allowed any amount of handling and was discharged from the hospital without a vestige or sign of the disease. In concluding, the author says that scurvy concerns us at present because, with the introduction of pasteurization, the tendency will probably be to boil the milk to insure its keeping. In other words, the cupidity of dealers will have to be reckoned with. Cooked milk is conceded to produce conditions favorable to scurvy. The condition is liable to be mistaken for rheumatism. It has been diagnosticated as sarcoma of the bone, and the diagnosis of abscess in these cases is not strange. It is liable to be taken for an orthopedic condition because of the marked paralysis which occurs. Cases of the disease occur seldom enough to allow everybody to forget. Then, too, new generations come along who have never fallen over this wheelbarrow, and consequently are not familiar with the rough and tumble fall which a wheelbarrow can give.

A case is reported by Bendix,² which was of interest because, at the age of eleven months, the child presented the general symptom-complex of the fully developed disease, and not the usual rudimentary form (*formes frustes*). There was involvement of almost the entire osseous system. There was subperiosteal hemorrhage, with swelling

¹ Archives of Pediatrics, September, 1912

² Med. Klin., May 19 1912

involving the bones of the face, especially on the right side. For the first fourteen days while under observation, the child ran a temperature of moderate grade, which gradually dropped to normal after the use of raw milk as a diet.

DeBuys¹ reports a case of infantile scurvy in a white female, aged eleven months, which was accompanied by rather extreme exophthalmos of the right eyeball which protruded almost out of its socket, being pushed forward, outward, and downward. The eyelids were clear, but apparently puffy. There was no pulsation, and the movements of the eye were not impaired. The sclera and conjunctiva were normal. Extreme exophthalmos is rarely seen in scurvy, though protrusion of the eyeball may occur in from 6 to 7 per cent. of the cases. It may be due to ecchymoses into the loose areolar tissue around the orbit or to subperiosteal extravasations of blood in the bones of the orbit.

THE ADRENAL GLANDS

A few interesting observations have been made on the adrenal glands during the past year. Some of these would tend to modify our ideas in regard to the relationship of the adrenal glands to blood pressure.

In an admirable paper, Glynn² discusses the ADRENAL CORTEX, ITS RESTS AND TUMORS, TOGETHER WITH ITS RELATION TO OTHER DUCTLESS GLANDS AND ITS RELATION TO SEX. He finds that the adrenal cortex and medulla have a different development and different functions; the former is especially connected with growth and sex characters, the latter with blood pressure. *Tumors* are rare, primary malignant tumors especially so, the most usual being (a) round-cell sarcoma; (b) adrenal hypernephroma, an epithelial-like growth of cortical origin. Sarcomas are the commoner; they are more frequent in children, especially in male children. Adrenal hypernephromas are five times more frequent in female children, though in adults they are slightly commoner in males. Sarcomas and adrenal hypernephromas differ histologically, and in children, at any rate, differ clinically. Adrenal hypernephromas are associated with sex abnormalities, almost invariably in children, usually in adult females before the menopause, but apparently never in adult females after the menopause, or in adult males. *Adrenal rests*, or bilateral hyperplasia of the adrenal gland, is found in at least 15 per cent. of female, but in only 0.07 per cent. of male pseudohermaphrodites. Hyperplasia and hypernephromas of the adrenal cortex in females are usually associated with a diminution of certain female, and the development of certain male, sex characters. The converse rarely occurs. The only conditions in which some female

¹ Journal of the American Medical Association, December 7, 1912.

² Quarterly Journal of Medicine, vol. v, No. 18.

sex characters are constantly acquired in males, or male sex characters fail to develop, are after castration performed before puberty, and occasionally in acromegaly. Premature development of female sex characters in females may occur with certain ovarian tumors, and of male sex characters in males with certain tumors of the pineal gland, adrenal cortex, and testicle. In children and young adult females in whom the sex abnormalities are acquired, there is usually unilateral malignant cortical neoplasia.

The neoplasia probably directly or indirectly causes the abnormalities. In pseudohermaphroditism, the sex abnormalities are mainly congenital, and the adrenal lesions, if any, are bilateral cortical hyperplasia or cortical rests. The hyperplasia possibly directly or indirectly causes the abnormalities, or some of them. Rests from the adrenal cortex are common in certain localities, especially in infancy, except in the kidney. They are usually of minute size, and are not associated with sex abnormalities unless there is much enlargement, when such may sometimes occur in pseudohermaphrodites. The enlargement of the adrenal cortex during breeding, pregnancy, and after castration, and the small size in deficient sexual development are additional evidences of the connection of the cortex with sex characters. The functional association of the adrenal with the pituitary and other ductless glands, and the appearance of certain sex abnormalities in acromegaly, indicate that a true solution of the connection between the adrenal cortex and the sex will only be found when the inter-relationships of the various ductless glands are better understood. Certain facts are opposed to the hypothesis that renal hypernephromas arise from the remnants of adrenal cortex, *viz.*: (a) The great dissimilarity in microscopic structure between hypernephromas of the renal and adrenal glands. (b) Renal hypernephromas apparently never influence growth or sex characters. (c) The difficulty of explaining why adrenal rests, though comparatively rare in the kidney, should produce such a common tumor as the hypernephroma, by far the commonest renal tumor, while adrenal rests in other localities, though comparatively common, especially in early life, should, like the adrenal gland itself, so rarely produce tumors either benign or malignant. These considerations support the statements of Stoerk, Zehbe, and Wilson and Willis, who maintain that renal hypernephromas rarely if ever arise from adrenal rests. Adrenal rests in the ovary are exceedingly uncommon. The ovarian hypernephroma does not produce the characteristic sex abnormalities; it probably arises from the lutein cells of the ovary itself.

Adrenals in Infectious Diseases. Moltschanoff¹ is led to believe that the adrenals play a very important part in infectious diseases, especially diphtheria. He arrives at this conclusion as a result of careful postmortem study of the adrenal glands in 42 children—29 were

¹ Jahrbuch f. Kinderheilkunde, Berlin, July, 1912, lxxvii, No. 1.

cases of diphtheria, and 6 were scarlet fever. In addition, he carried out a series of experiments, inoculating guinea-pigs with diphtheria toxin and epinephrin. His findings seemed to show that adrenalin in some manner helped to protect the organism against the poison of diphtheria. At first, in response to the toxin, the adrenals took on an increased activity, but this was followed soon by exhaustion of the adrenal cells and a consequent atrophy. The acute functional insufficiency of the glands gives rise to serious symptoms, and at times this insufficiency alone will lead to death. The use of epinephrin under these circumstances supplies the needed internal secretion and through this means the tone of the cardiovascular system is restored. From his studies, Moltschanoff believes that epinephrin should be used more extensively in the treatment of diphtheria, especially as a prophylactic in the early stages of the disease before cardiac weakness sets in.

Two years ago the **Influence of the Suprarenal Glands on the Sugar Content of the Blood** was discussed in these pages. In cases of disease of the suprarenal capsules, and in dogs from which the adrenals have been removed, there is a low sugar content of the blood. It has been found by some investigators that cases of Addison's disease show an exceptionally high tolerance for sugar, and that in dogs from which the suprarenals have been removed only low degrees of glycosuria could be produced through the administration of phloridzin. Knowing the intimate relationship of the pancreas to carbohydrate metabolism, the findings of Pemberton and Sweet¹ are very interesting. They were able to demonstrate that removal of the adrenal glands in the dog induced a flow of pancreatic secretion. When this flow was at its height, injections of epinephrin would inhibit the flow. Shortly after, or before, the blood pressure returned to its normal level, the pancreatic flow would return. In this manner the flow could be repeatedly inhibited. The tendency to pancreatic flow seemed very strong. The authors conclude that since removing the adrenals brings on a pancreatic flow, and since injections of epinephrin then inhibit the flow, and since the flow returns when the effect of the injection wears off (which can be repeatedly demonstrated in an animal), it is difficult to escape the thought that there is normally some such relationship between these glands.

The alleged **Existence of Epinephrin in Pathological Sera** has been investigated by Stewart,² who tested for this substance with segments of rabbit intestine and uterus. In all of the pathological sera so tested, the presence of adrenalin could not be detected. Serum from the adrenal veins of a dog, collected during massage of the gland, gave a distinctly positive reaction, while serum previously collected with the

¹ Archives of Internal Medicine, September 15, 1912.

² Experimental Medicine, June, 1912.

minimum of mechanical and circulatory disturbance of the gland gave a negative reaction. Serum from the adrenal veins without precautions to avoid disturbing the gland sometimes gave positive, sometimes negative, tests. Serum from blood obtained without the slightest disturbance of the glands from a pocket of the inferior vena cava which receives only blood from the adrenals, and from the transverse lumbar veins crossing them, gave no evidence of epinephrin, except during stimulation of the splanchnics, when the reaction for epinephrin was positive. Serum of blood collected from the vena of dogs, by a catheter pushed up through one femoral vein until the orifice was just anterior to the openings of the adrenal veins, yielded no evidence of the presence of epinephrin, whether the splanchnics (one or both) were stimulated or not, any epinephrin contributed by the glands during stimulation of the splanchnics being too much diluted.

In their work on the **Relation of the Adrenal Glands to Blood Pressure**, Hoskins and McClure¹ found that the amount of epinephrin required to affect blood pressure with the adrenals intact, compared with the quantity required after occlusion of the adrenal circulation indicates, as a maximum, an epinephrin secretion of 0.13 c.c. of a 1 to 1,000,000 solution per kilo of body weight per minute. They say this value is probably too high. The amount of epinephrin necessary to affect blood pressure is, on an average, approximately 0.42 c.c. of a 1 to 1,000,000 solution per kilo of body weight per minute in the intact animal, and 0.55 c.c. after removing the adrenal glands. The characteristic primary effect of epinephrin administered intravenously is lowering of blood pressure. The quantity required to cause minimal hypertension is several times this quantity, or at least 10 to 20 times the amount secreted by the adrenal glands. Incomplete data indicate that peristalsis is depressed by quantities of epinephrin inadequate to raise blood pressure. They conclude that adrenal secretion is not, therefore, a direct factor in the maintenance of the tone of the vasomotor system, and that it is probable that other activities controlled by the sympathetic nervous system are not directly dependent upon adrenal activity."

Asher,² by an experiment in which he removed from the animal all of the abdominal viscera excepting the adrenal glands, showed that a rise in blood pressure could still be brought about by stimulating the splanchnic nerves. He believes that this is a proof that, in response to the normal stimulation, the adrenals have furnished the pressure-raising principle, epinephrin, to the rest of the body. Through prolonged stimulation of the splanchnics, a continuous high blood pressure could be maintained. If the adrenal veins were obstructed in this experiment, no rise in blood pressure could be obtained.

¹ Archives of Internal Medicine, October, 1912.

² Zeitschrift f. Biologie, vol. lviii, No. 274.

Cannon,¹ Aub, and Binger have shown by experiment that the administration of very small amounts of nicotine to an animal can call forth an increased activity of the adrenal glands. Within a short time of the administration of the drug, they were able to detect an increased amount of epinephrin in the blood of the adrenal veins.

Adrenal Tuberculosis. Crowell² has detected 2 cases of adrenal tuberculosis post mortem, which had not been recognized clinically. The disease occurred in Filipinos. Hence, the question arises whether or not in the dark races this condition can be diagnosticated. Extremely careful search for pigmentation of the mucous membrane postmortem revealed nothing, excepting two isolated dark spots on the tip of the tongue in one of the cases. These dark spots might have occurred from extraneous sources, such as the teeth. The adrenals in both cases were destroyed by the tuberculous processes, and the semi-lunar ganglia contained chromaffin. In one case there was hyperplasia of the islands of Langerhans, associated with adrenal and thyroid tuberculosis. In the other case, in addition to the adrenal tuberculosis, there was cirrhosis of the parathyroid gland.

Influence of Röntgen Rays on the Adrenal Glands. Zimmern and Cottenot³ have been studying the influence of the Röntgen rays on the adrenal glands. Reasoning from the fact that the x -rays had an inhibitory effect upon the hyperactivity of other ductless glands (thyroid, thymus, and hypophysis), these investigators thought it logical to expect such an effect on the adrenal glands, and, with this idea in mind, they began to treat cases of high blood pressure with the x -ray. Their experience, they believe, has proved their assumption to be correct. X -ray treatment of the adrenals brings about a fall in high blood pressure, together with a disappearance of the subjective symptoms which accompany this condition.

Addison's Disease. A case of Addison's disease is reported by Pulawski⁴ in which the points of interest were the existence of tuberculosis of the adrenals with no demonstrable lesions in the lungs (postmortem), and a latent tuberculosis of the bronchial and mesenteric glands which ran its course without fever or other symptoms. The parathyroid glands were greatly enlarged, and, microscopically, showed small round-celled infiltration. In all probability, the final symptoms of the case—tetanic convulsions—were due to this pathological change. There was found a pronounced hyperplasia of the entire lymphatic system—status lymphaticus. This condition has been noted in 6 per cent. of 674 cases by Lewin. Hedinger found 7 cases of Addison's disease with associated status lymphaticus. In addition to the hyperplasia of the lymphatic system, there was a hypertrophy of the thymus.

¹ *Journal of Pharmacology and Experimental Therapeutics*, March, 1912.

² *Philippine Journal of the Medical Sciences*, November, 1912.

³ *Wien. klin. Woch.*, May 2, 1912.

⁴ *Ibid.*, November 20, 1912.

The heart and aorta, as well as the genital organs, showed distinct hypoplasia. The author remarks that possibly in time, when the attention of investigators is attracted more in this direction, numerous similar cases will be recognized, especially in young individuals who die with hypertrophied thymus. The author has found no references in the literature to changes in the parathyroid glands associated with Addison's disease. If, in addition to these changes in the lymphatics, the thymus, and the parathyroids, one takes into consideration the hypoplasia of the heart, the great vessels, and of the genital organs, the conclusion must be reached that Addison's disease, which depends upon a disturbance of function in one of the ductless glands, leads to changes in the function of other ductless glands. This conclusion is similar to the facts found in Basedow's disease, which is so often accompanied by hypertrophy of the thymus, status lymphaticus, changes in the ovaries, in the adrenal glands, in the pancreas, and in the hypophysis.

In the TREATMENT of this malady, Munro¹ reports a case in which he has attained success through the use of tuberculin. The patient was an intelligent woman, aged thirty-four years, and unmarried. She came under observation in April, 1907. Two years earlier, when in good health and having no serious illness, she began to ail and gradually grew worse. She complained of lassitude and lack of strength, whereas formerly she was fond of getting about and of occupation. She had no appetite, but forced herself to eat. There were frequent headaches, lumbar backaches, and constipation, varied by attacks of diarrhea. She suffered from postnasal catarrh, and the throat was sometimes sore, but she had no cough. There were increasing weakness and nervous irritability, and some nausea at times. Latterly, there was much mental depression. A month before she came under observation, she noted a mottled brown appearance of the skin on the thigh, and later she and her friends had remarked it around the mouth and in other spots. There had been dull pain, not always present, between the clavicle and the right breast, and for many years the right knee had been painful after exercise. Two years before coming under observation, a younger sister, to whom she was much attached, died of phthisis. The patient went to see her just before the end. She felt the shock very much, and dated her illness from that event. There was no other family history of tuberculosis. Upon examination, a decidedly fine tremor of the hands and legs was noted, but no tenderness. There was no enlargement of the thyroid or exophthalmos. The right leg was $1\frac{1}{2}$ inches shorter than the left. There was a prominent node at the junction of the second rib and cartilage on the right side, which was slightly tender. The shortening of the leg was between the hip and knee. The pelvis was tilted slightly to the right. Movements of

¹ British Medical Journal, March 23, 1912.

the knee- and hip-joints were perfect. An abnormal body odor was present, which formerly did not exist. The brown pigmentation of the skin was most noticeable in irregular patches on the chin, upper and lower lips, sides of nose, forehead, upper and inner parts of the thighs, on the buttocks, around the anus, on the neck, forearms, and shoulders. It was traceable on the mucous surfaces of the mouth, conjunctivæ, and genitals, as well as on the palmar and dorsal surfaces of the hands. Blood examination revealed normal conditions. Munro says that although he embarked on this case with a strong disposition to look for latent or early phthisis, the clinical picture and history, as above disclosed, did not seem wholly explicable by any diagnosis but that of Addison's disease of tuberculous origin. The blood pressure he found to vary between 110 and 120. The tuberculin treatment was started on April 13, 1907. The first injection given was $\frac{1}{1500}$ mg. T. R. This dose was, after a time, increased to 0.001 mg., and this was eventually given weekly for several months. During the first year the injections were followed by slight reaction. Later, these effects were absent, and larger doses, given at intervals of four days, were tolerated well with good results. During the last two months doses up to 0.002 mg. had been given every fourth, and lately, every second day. Slow but sure progress was apparent from the first. About six months ago, rapid improvement set in. The patient began to say she felt more like her old self. At about the same time the pigmentation areas began to show clearance. In April, 1909, the patient's condition was practically one of good health. In March, 1912, the patient still remained in good health. Little further change had taken place in the details of the pigmentation, but this was generally lighter. Munro remarks that the cure suffered no interruption in spite of the anxious home conditions occasioned by the illness and death of the patient's father.

GOUT

The literature dealing with gout has been very limited during the year. Perhaps the most important contribution of the year is that of Folin and Denis in their presentation of *a new method for the quantitative determination of uric acid in the blood*.

The Nitrogen and Nuclein Metabolism in Gout has been studied by Levene and Kristeller.¹ The subject of the study was a patient with gout in a very advanced stage. Large gouty deposits were present in nearly all of the joints, and prevented active movements. The patient was put upon a daily diet containing about 6 grams of nitrogen. When the daily output became fairly constant (about 5.5 grams),

¹ Journal of Experimental Medicine, September, 1912.

the experiments were begun. These consisted in the addition of urea to the normal diet. The urea was added to the first morning meal and the nitrogen output was followed in twenty-four-hour periods day after day. In a similar manner, experiments were carried out with asparagin, plasmon, uric acid, and nucleic acid. It was observed that after the administration of very simple nitrogenous substances, such as urea and asparagin, the patient did not remove the surplus nitrogen in the same manner as a normal individual, or even as a patient with granular nephritis who was placed on a low nitrogen intake. The increase in the nitrogen output was comparatively low during the first twenty-four-hour period, and this slightly increased excretion usually continued for several days.

This suggested a comparison of the character of nitrogen elimination when the patient was placed on a daily diet containing about 13 grams of nitrogen. On this diet, after administration of the urea, the rise in the nitrogen output took place with greater rapidity and with greater intensity than on the low protein diet. Also, the nitrogen output in the intervals between the experiments appeared to be more uniform than when the patient had been on a low protein intake. For this reason, it was decided to perform a new series of experiments, placing the patient on a diet abundant in nitrogen. But, even under these conditions, the increase in the output of nitrogen, after the administration of additional nitrogenous substances, was very low and protracted. This made it difficult to detect the differences in the output during the intervals between experiments and during the days of the experiments.

A new series of experiments was then performed, in the course of which the additional nitrogenous products were added, not during one day, but during three or four consecutive days, and the output of nitrogen was followed in twenty-four-hour periods for a number of days. This change in daily nitrogen intake, however, brought little change in the results of the experiments, for the increase in nitrogen output after the administration of nitrogenous substances was rather insignificant, and the excretion was very often protracted. For the sake of convenience, therefore, it was decided to estimate the increase in the nitrogen output during the days of the experiment and during the two days following the experiment.

While the patient was under observation, which was for three winter terms, it was noticed that after the administration of purin bodies the nitrogen output in animals had a more regular course if they received simultaneously considerable quantities of sodium bicarbonate. It was, therefore, decided to repeat the experiment on the patient, administering to him daily 15 grams of this salt. Apparently, under these conditions, the patient removed the surplus nitrogen intake with greater rapidity than without the bicarbonate of sodium.

Bass and Wiechowski¹ have found that uric acid in isolatable amounts occurs constantly in the blood of normal men on a purin-free diet, and that atophan does not increase the uric acid content of the blood. The purin bases exceed in amount the uric acid in the blood of men on a purin-free diet about four to ten times.

Wiechowski² has found that generally, throughout the mammalia, allantoin constitutes the principal end-product of purin metabolism (more than 90 per cent.), while in man the principal end-product is uric acid. The lower monkeys show, just as the higher mammals, much allantoin and little, or no, uric acid, while the author found uric acid and no allantoin in three chimpanzees—the same relations as in man.

Brugsch,³ with Schittenhelm, found that persons suffering from gout differed from those in health and from those afflicted with other arthritic conditions in that, on a flesh-free diet, they retained uric acid in distinctly recognizable quantities. This renders it possible, in every form of arthritis where gout might be suspected, to recognize the condition as gout, or not, through an examination of the blood for uric acid. The simplest means for the diagnosis of gout is, therefore, a search of the blood for uric acid after the patient has been on a flesh-free diet for three days. Schittenhelm and the author differentiated four forms of gout: (1) Acute arthritis urica; (2) subacute chronic polyarthritis urica; (3) renal gout, and (4) arthritis urica chronica. As to the character of gout, Brugsch says that in all forms, whether they be cases of arthritis urica or torpid cases with joint deformities, the accumulation of uric acid in the blood is primary. The overloading of the blood with uric acid above the limits of solubility leads to the deposition of uric acid in the connective tissues, and, of these, the joints especially show a great affinity for uric acid, which fact can be demonstrated *in vitro*. For the occurrence of this deposition, the protracted retention of uric acid in the blood is apparently necessary in order that the more difficultly soluble, and therefore more readily deposited, laktimurat may be formed from the laktamurat. The prolonged retention of uric acid in the blood in all cases is dependent upon a certain torpidity of the kidneys.

For the **Detection of Uric Acid in the Blood**, Nukada⁴ recommends that the proteid be precipitated out of the serum with "Monoalkali-phosphat," and the filtrate precipitated with copper. This precipitate should not be treated with sodium sulphide, but with hydrogen sulphide in the presence of a slightly alkaline reaction. With this method, uric acid crystals (murexid test) could be obtained from 200 c.c. of horse blood to which had been added 0.002 gram of uric acid.

¹ Wien. klin. No. 47, 1912.

² Prager med. Woch., 1912, p. 275.

³ Berl. klin. Woch., August 19, 1912.

⁴ Zeitschr. f. Exper. Path. u. Therap., Band xi, Heft 1.

A simple method for the detection of uric acid in the blood and other colloidal solutions is described by Budzent and Apolant.¹ This method depends upon the fact that the uric acid in the blood occurs in the form of a salt, monosodium urate, and is therefore dialyzable. It never occurs in colloid form. The procedure is as follows: 20 c.c. of blood are placed in a dialyzing sac, and this suspended in 40 c.c. of distilled water. The dialysis should be allowed to go on for six hours, the water being changed three times in that interval. The dialysate should be evaporated to dryness and the murexid test applied. This method is not of value for quantitative estimations, but recommends itself because of its simplicity for the qualitative determination of uric acid in the diagnosis of gout in practice, as well as a control in following results of treatment.

Folin and Denis² have made a very important contribution to the work of the year on gout. As the authors say, in beginning their paper, "Notwithstanding the great physiological and clinical interest which for more than a hundred years has been attached to the 'uric acid in the blood,' no suitable method for the determination of this uric acid has yet been discovered." It is the discovery of such a method that the authors present in their paper. They discuss the various means which have been used in the attempts to determine uric acid in the blood and call attention to their limitations.

The new method is a colorimetric one, and is based on the highly delicate color reaction which results with their reagent. This "uric acid reagent" is a solution of phosphotungstic acid, which gives a positive test with one part of uric acid in 1,000,000 parts of water. The reagent contains 100 grams of sodium tungstate, 80 c.c. of phosphoric acid (85 per cent.), and water up to one liter. These are boiled together for one or two hours and the resulting mixture, on cooling, is diluted with water up to 1 liter.

The protein is coagulated by using five volumes of $\frac{n}{100}$ acetic acid solution (10 c.c. of normal acetic acid and water up to a liter). The blood is collected in previously weighed, wide-mouth bottles containing a small amount of finely powdered potassium oxalate. From the subsequent weight of each bottle is obtained the weight of the blood. Five times this weight of $\frac{n}{100}$ acetic acid solution is placed in an ordinary liter flask and heated to boiling. The oxalated blood is then added to this solution, and the heating continued to the boiling point. This mixture is then filtered while hot. The coagulum on the filter is transferred back into the flask by means of a spatula, about 200 c.c. of boiling water are added, and it is allowed to stand for five minutes. This mixture is then filtered through the paper used for the first filtration. The filtrate should be nearly as clear as water, and will be so if

¹ Deutsch. med. Woch., 1912, No. 13.

² Journal of Biological Chemistry, vol. xiii.

the original blood was promptly shaken with the oxalate to prevent clotting. The combined filtrate and wash-water containing the uric acid is further acidified by the addition of 5 c.c. of 50 per cent. acetic acid and evaporated over a free flame in a deep, semiglobular, 250 c.c. porcelain dish to a very small volume (about 3 c.c.). The liquid is then poured into an ordinary small centrifuge tube and the dish washed with two successive portions of 0.1 per cent. lithium carbonate solution, using about 2 c.c. for each rinsing, any solid material adherent to the sides of the evaporating dish being removed by rubbing with a rubber-tipped stirring rod. To the liquid in the centrifuge tube, which at this stage should not be greater than 10 c.c. in volume, is added 5 drops of 3 per cent. silver lactate solution, 2 drops of magnesia mixture, and a sufficient amount of strong ammonium hydrate (10 to 15 drops) to dissolve the silver chloride. This is centrifugated for two or three minutes, the supernatant liquid poured off, and to the residue are added 4 or 5 drops of fresh saturated hydrogen sulphide water and 1 drop of concentrated hydrochloric acid. The tube is now placed, for a period of five or ten minutes, in a beaker of boiling water to remove the excess of hydrogen sulphide, the removal of which is important since it gives a blue color reaction with the phosphotungstic reagent. To insure this removal, a drop of 0.5 per cent. lead acetate is added to the contents in the centrifuge tube as it is taken out of the hot water. Usually little or no lead sulphide (blackening) is produced, showing that all the hydrogen sulphide is gone, as the lead acetate added is enough to give a heavy black precipitate. If such a precipitate occurs, it is safest to heat the tube in a water-bath for another five minutes, and then add another drop of lead acetate solution. When all the hydrogen sulphide is thus removed, the contents of the tube are centrifugated for a minute or two. The supernatant liquid is decanted as completely as possible into a small beaker, and the inside of the tube washed with a stream of water from a wash bottle, care being taken not to disturb the solid residue at the bottom of the tube. The wash-water (which should not exceed 5 c.c. in volume) is then added to the liquid in the beaker, and to this acid solution containing the uric acid is then added 2 c.c. of the uric acid reagent, and 10, 15, or 20 c.c. of saturated sodium carbonate solution, depending on whether the color obtained requires a final dilution to 25, 50, or 100 c.c.

Three volumetric flasks, representing 25, 50, and 100 c.c. respectively, must be at hand, and the blue unknown solution is transferred to that one in which the dilution will be suitable for colorimetric comparison with the standard solution, and then diluted with water up to the mark. The standard solution obtained from 0.001 gram of uric acid, when treated with 2 c.c. of uric acid reagent, 20 c.c. of sodium carbonate, and made up to 100 c.c., should be made just before the addition of the sodium carbonate to the unknown. The latter sometimes

needs to be filtered before being transferred to the colorimeter cylinders for the final color comparison.

The calculation of the results obtained from the colorimetric readings is not difficult, though it must not be forgotten that it is not practicable to take any particular quantity of blood for the work, since the usual thing in clinical cases is that the amount of blood available is so small that one takes all that has been collected. The following formula gives the amount of uric acid per hundred grams of blood:

$$\frac{20 V}{R W} = \text{milligrams of uric acid per 100 grams of blood.}$$

In this formula 20 represents the depth in millimeters of the standard solution used for a comparison, and R represents the reading in millimeters of the unknown solution. V represents the volume (25, 50, or 100 c.c.), to which the unknown is diluted, and W represents the weight of blood taken for the determination.

The authors obtained the following results from this method:

Volume of blood taken for analysis in c.c.	Uric acid added, mgm. per 100 c.c.	Uric acid found, mgm. per 100 c.c.
50	0	less than 0.05
25	1	0.96
25	1	0.98
25	2	2.00
15	2	2.00
15	4	3.90
25	4	4.00
20	6	5.80
10	8	7.40
15	8	7.50
10	10	9.40
10	10	9.60

Treatment of Gout. In discussing the treatment of gout, Brugsch¹ considers that a *purin-free diet* for a long period of time is of fundamental importance. The diet should not be purely vegetable, but should contain milk, eggs, and farinaceous foods. In the acute onset, *morphine* should be given, and, on the following day, *colchicum*. With the introduction of an entirely purin-free diet, treatment with *atophan* should begin. The author explains the action of atophan in the following manner: In the endogenous, as well as the exogenous, nuclein exchange, the entire amount of the split-up nuclein is not brought into the exchange, but a part remains as a reserve in the body, apparently in the liver. This storing up in the liver corresponds to the storing up of glycogen, fat, and proteid by the liver. Atophan has a special action

¹ Berl. klin. Woch., August 19, 1912.

upon the exchange of this portion of the intermediary nuclein metabolism. The author gives 2 to 3 grams of atophan per diem in divided doses of 0.5 gram at the onset (immediately before or after). The atophan is not given during the severity of the joint attacks. The patient should be given the drug and instructed to take it as soon as the first premonitory signs of an attack appear. This is almost the only medicament which the author uses in gout. He lays special weight upon the accessory treatment. He recommends *brine baths* (3 per cent. at 37° C.), and *massage of the joints*, with the external use of *derivantien*. *Mud packs* applied to the joints act beneficially.

Skorczewski and Sohn¹ found a greatly increased excretion of uric acid after the use of *atophan*. If the drug was used for a long period of time, the excretion of uric acid returned to nearly the same amounts as had been excreted before the use of the drug. The diazo reaction appears in the urine during the period of administration. During the negative phase of the uric acid excretion, there is a greatly increased output of the purin bases. Immediately after the use of atophan, there is a retention of the chlorides, which suggests a change in the renal function. An increase in the amount of neutral sulphur in the urine shows that there is an increase in the amount of oxyproteic acid, and that the assumption of Starkenstein that, in the use of this drug, there is decreased oxidization in the organism is probably correct. Since increased amounts of neutral sulphur occur in the urine almost exclusively in patients with profoundly disturbed metabolism (carcinoma, hunger, chloroform narcosis), this occurrence after the use of atophan, in spite of the apparently good effect of the drug, shows that its action on the organism is not an indifferent one.

The investigations of Dohrn² show that, in gout, the action of atophan upon endogenous, as well as injected, uric acid is inconstant. Sometimes an increased excretion results, but, more often, this increase does not take place. In one case he noted an increase at times, and at other times no increase under the action of the drug.

If the assumption be accepted that atophan causes an increase of uric acid in both the blood and the urine through an accelerated disintegration of the forerunners of uric acid, then from the changed relation of the uric acid in the urine after the use of atophan in cases of gout, one can draw only the conclusion that the specific relations in gout are not affected by atophan; for this specificity lies in the fact that while there is a high uric acid content in the blood, there is a relatively low uric acid content in the urine. This specific relation, at least is not changed in those cases in which uric acid is injected, and after the administration of atophan only a part of the amount injected appears in the urine.

¹ Zeitschr. f. Exper. Path. u. Therap., xi, Heft 2.

² Zeitschr. f. klin. Med., lxxiv, Nos. 5 and 6.

The author assumes that, in the oxidation of the nucleic acid molecule to uric acid, the base, in consequence of the disturbed metabolism, goes along with the acid radical, not being split off. If these substances appear in the blood, naturally alkali salts will arise, not only monosodium urate, but also alkali salts of phosphoric acid. Hence, the solubility of nucleic acid must be greatly increased. Of course this assumption does not apply to all of the nucleic acid, a part of it acting in the normal manner, the base being split off from the molecule in the process of oxidation.

Plehn¹ found that, in many undoubted cases of gout, an increase of the uric acid in the blood could not be detected. Atophan doubled the excretion of uric acid in chronic cases. In one case in which an increase of the uric acid content in the blood could not be determined, the excretion in the urine was quadrupled after the use of atophan. The increased excretion is of longer duration in cases of gout than in healthy individuals. The local inflammatory phenomena are usually benefited by atophan. The author has never observed any injurious results from the use of the drug.

DIABETES

No marked advance has been made in our knowledge of diabetes, although the literature on the subject has been very extensive during the past year. In regard to the etiology of the disease, as Fitcher² says, it is unwise from experience to accept as settled any new theory advanced to explain the cause of diabetes mellitus. He goes on further to say that it must now be accepted as positively proved that, not only the pancreas, but also the adrenals, thyroid, parathyroids, and pituitary have a very important influence on carbohydrate metabolism. Although lesions of the pancreas have been found in a considerable percentage of cases of diabetes, it is now clear that morbid changes in that organ will not explain all cases, even when alterations in the islands of Langerhans are also taken into account. The essential and primary disturbance may be in one or another of the ductless glands.

There is undoubtedly a marked correlation of the internal secretions of the ductless glands. Thus the internal secretions of the adrenals and pancreas mutually retard the action of each other. The most recent theory concerning carbohydrate metabolism is that first advanced by Zuelzer and now supported by many physiologists. According to this view, one of the most important functions of the adrenals is to "mobilize" or set free the carbohydrates in the liver, and possibly in other storehouses also. Under normal conditions, however, this influence

¹ Deutsch. med. Woch., 1912, No. 3.

² Journal of American Medical Association, December 21, 1912.

is counteracted or exactly balanced by the hormone contained in the internal secretion of the pancreas, and we have a constant normal flow of sugar from the liver. When, however, the chromaffin system is for any reason overstimulated, as it may be through the sympathetic nervous system, there is an overproduction of the "accelerator" hormone of the adrenals; the "retarding" hormone of the internal secretion of the pancreas is more than counterbalanced, the glycogen in the liver is rapidly "mobilized" or set free, and a hyperglycemia and glycosuria result. A similar result occurs in the cases of so-called pancreatic diabetes. Here the adrenal hormone may be normal in amount, but, owing to the pancreatic disturbance, the pancreatic hormone is absent or diminished, and again the adrenal hormone is enabled to mobilize the glycogen of the liver.

A somewhat analogous explanation may be subsequently found to explain the glycosurias in pituitary and thyroid diseases. The theory that hyperglycemia results from deficient consumption or oxidation of glucose in the tissues has fewer adherents than formerly. It may still be shown, however, that Cohnheim's theory is in part correct. At present the trend of opinion is in favor of the view that the hyperglycemia and glycosuria are dependent on overproduction of sugar in the liver.

In support of the other principal theory accounting for diabetes, namely, that the tissues, particularly the muscles, show an inability to destroy glucose, Knowlton and Starling¹ have found that the heart muscle of healthy dogs has power to destroy a certain amount of grape sugar, while the heart muscle of diabetic dogs possesses no such power. Their experiments were carried out on dogs' hearts isolated with the lungs and kept beating for an hour or more, according to the method of Jerusalem and Starling. Further researches have proved that the normal blood, and from it the normal tissues, contain a substance capable of destroying sugar, and that this substance is formed in the pancreas.

Heiberg² has studied the influence of heredity upon diabetes by investigating the family histories of 100 diabetic patients and of 100 other patients of the same class not including pay patients. Only 7 relatives with diabetes were found among the 100 non-diabetics, while 18 were found among the diabetic cases. In 7 of the diabetics, the disease began before the age of ten years, and, in 18 of them, between the ages of ten and twenty years. He concludes that there is some evidence in favor of heredity as a predisposing factor in the disease.

Two families have come to Foster's attention³ in which two or more children of the same parents developed diabetes in youth. In

¹ *Lancet*, September 21, 1912.

² *Hospitalstidende*, Copenhagen, March 20, 1912.

³ *Johns Hopkins Hospital Bulletin*, February, 1912.

the first family, the father and three sons were affected. The first son died at eighteen years; the second son was found to have glycosuria at the age of seventeen years, which disappeared under treatment, the patient remaining well for ten years thereafter. The third son died one year after the first appearance of the disease. In the second family, there was no diabetic tendency in either the parents or the grandparents, the parents being both healthy and strong. The first child was taken with diabetes at the age of six years, and died in coma one week after the onset of the symptoms. The second child developed the disease at eleven and one-half years, and succumbed six months after the onset. The third child remained healthy until the seventeenth year, when the disease developed and led to his death about one year later. The fourth child developed the symptoms in its ninth year, and succumbed to the disease in the course of a few months. A careful perusal of the literature by the author revealed only 40 instances in which diabetes occurred among brothers and sisters with its manifestation in the early part of life.

v. Noorden¹ reports a case of diabetes of nervous origin in a man, aged forty years, who had an evident inherited neuropathic taint. The disease developed at the age of thirty-six years, following a period of great anxiety connected with the massacres in Russia. Severe insomnia, loss of appetite and weight, with obstinate constipation, were accompanied by the presence of 1.5 per cent. of sugar in the urine which persisted even on an antidiabetic diet. Sleepless nights were followed by an exacerbation of the glycosuria. v. Noorden found that in this as well as in a number of other instances in which the nervous element was so marked in the disease, true diabetes may develop from the nervous form. His patient kept well on an antidiabetic diet for one year, when another physician found no evidence of the disease in the urine and advised the patient to go on a general diet. Not long after this he began to lose weight, and 5.6 per cent of sugar was found in the urine. Attempts to reduce the sugar by reduction of the carbohydrate food gave rise to acetonuria, and the patient became a confirmed diabetic.

Pathology. v. Hanseemann² recognizes two groups of changes in the pancreas in diabetes: (1) Those which lead to diabetes only when a large part of the gland is destroyed; (2) those in which diabetes is present from the beginning. In the first group belong fibrous inflammatory changes with scar and stone formation, the arteriosclerotic connective tissue overgrowths, chronic inflammation, and acute hemorrhagic pancreatitis. The author notes that in the last mentioned condition glycosuria seldom appears, because its development requires a certain incubation period in the course of which the case usually

¹ Med. Klinik., January 7, 1912.

² Berlin. klin. Woch., No. 20, 1912.

dies. Pancreatic carcinoma also belongs in this first group. In the second group he places granular atrophy of the pancreas accompanied by decrease in the size of the cells, development of connective tissue, and small cell infiltration. While the author formerly held that changes in the islands of Langerhans were responsible for diabetes, he is now led to believe that these formations are nothing more than parenchyma, and that they are so inconstant in number and form that they cannot be held responsible as a cause of this disease.

Caro¹ has investigated the blood picture in diabetes mellitus, and invariably found a reduction of hemoglobin, with a decrease in the number of erythrocytes. There was no leukocytosis. In 22 of his 28 cases, he found a relative lymphocytosis, and in 15 of these cases the lymphocytosis ranged from 40 to 70 per cent. In these cases the lymphocytosis was of a mild grade and held no relation to the severity of the disease nor to the amount of sugar in the urine. Eight cases showed distinct eosinophilia.

Pribram² found a greatly increased output of colloidal nitrogen in the urine of three diabetics. In all three cases the output decreased under Carlsbad treatment. In the first case, in the course of a month and a half the amount of urine decreased from 4900 to 3350 c.c., the sugar from 294 grams to 214.4, while the colloidal nitrogen decreased from 4.75 to 0.486 grams. In the second case, in a little over a month the urine decreased from 6500 to 2500 c.c., the sugar from 455 to 80 grams, while the colloidal nitrogen decreased from 4.86 to 2.3 grams. In a third case, in the course of a month and a half the urine decreased from 4000 to 1000 c.c., the sugar from 160 to 54 grams, and the colloidal nitrogen from 4.84 to 2.9 grams.

The author looks upon this increase in excretion of colloidal nitrogen as probably due to the presence of disintegration products of the proteids in their higher molecular form, and he suggests³ that diabetic coma, like uremia, may be due to poisoning with toxic disintegration products of the proteids.

Experimental Diabetes. Cecil⁴ found that neither inanition nor the prolonged injection of secretin has any noteworthy effect on the number, size, or structure of the islands of Langerhans in the dog's pancreas. In the guinea-pigs' pancreas, the islands are in no way altered. In phloridzin diabetes, he found that the islands are not formed out of exhausted or degenerated acini, but that they develop from the ducts or acini, with which they are often in direct continuity.

King, Moyle, and Haupt⁵ have studied *glycosuria following anesthesia produced by the intravenous injection of ether*. They found the glyco-

¹ Berl. klin. Woch., August 5, 1912.

² Zentralbl. f. inn. Med., 1912, No. 21.

³ Deutsch. Arch. f. klin. Med., 1911, cl.

⁴ Journal of Experimental Medicine, July, 1912.

⁵ Ibid., August, 1912.

suria resultant from the intravenous route to be about the same as that resultant from the respiratory route. The effect of asphyxia is ruled out by the intravenous method because the animal is breathing the air of the room deeply and regularly. They arrived at the following conclusions from their experiments:

1. By introducing intravenously into dogs a solution of 5 per cent. ether in normal saline (0.9 per cent.), a satisfactory surgical anesthesia can be produced.

2. Associated with this anesthesia, a glycosuria occurs in healthy dogs fed on a meat diet.

3. Normal saline (0.9 per cent.) introduced in exactly the same manner does not cause a glycosuria.

4. The glycosuria is, in general, associated with a hyperglycemia.

5. The glycosuria does not make its appearance until the condition of anesthesia has been produced.

6. The intravenous method of producing anesthesia employed in their studies eliminates largely the factor of asphyxia.

7. Consequently, by this mode of administration, ether may cause glycosuria without asphyxia.

8. The addition of ether to normal saline solution (0.9 per cent.) modifies the property of the latter to produce diuresis.

9. Associated with the intravenous administration of both the saline and the ether-saline solutions there occurs a rise of body temperature.

Ringer¹ has carried out a series of metabolic studies in experimental diabetes. He found that, in phlorhidzin glycosuria, the protein metabolism rises in part because of the hypoglycemia which is present in that condition. The giving of small portions of glucose to phloridzinized animals results in a sparing of protein, although all the glucose is eliminated in the urine and none of it is burnt. This lends support to Landergren's hypothesis which assumes that in starvation a certain fraction of protein is metabolized for the formation of glucose, and that this fraction can be spared by carbohydrates and not by fats. The protein metabolism above the starvation requirement in pancreatic diabetes does not rise as high as in phloridzin diabetes. The giving of glucose to a dog with pancreatic diabetes does not spare any protein. It is suggested that the protein metabolism is lower in pancreatic than in phloridzin diabetes because of the hyperglycemia which prevents the catabolism of the so-called "dextrose protein."

Symptoms.—Labbe² lays stress on the importance of distinguishing between the groups of symptoms due, on the one hand, to the excess of sugar in the blood, and, on the other hand, to the acidosis in diabetes mellitus. The difference in the effect of large doses of sodium bicar-

¹ Journal of Biological Chemistry, September, 1912.

² Presse Médicale, April 3, 1912.

bonate in acidosis and in coma confirm the difference in their causal factors. The acidosis, the result of intoxication with the acetone bodies, is characterized by somnolency, vertigo, dyspnea, vomiting, diarrhea, etc., but coma shows other symptoms—muscular relaxation, loss of consciousness and disturbances in respiration, circulation, and temperature. When, in the course of progressive acidosis, coma comes on suddenly it never gives the impression of being an aggravation, but seems to be a superimposed complication. The two are closely associated, but they may possibly be due to intoxication by different mechanisms. Many features of coma suggest intoxication from polypeptids. The author cites a number of cases in which the acidosis was kept under control with sodium bicarbonate, but coma suddenly developing was uninfluenced by it.

Varieties.—In discussing glycosuria, Garrod¹ directs attention to many different morbid conditions which bring about disturbance of the metabolism of carbohydrates and to the fact that such disturbances manifest themselves in several different ways: By a lowering of glucose tolerance without actual excretion of sugar in the urine; by a spontaneous excretion of sugar in smaller or larger amount during limited periods of days, weeks, or months; and by a persistent glycosuria, accompanied, in its higher grades, by the associated symptoms which go to make up the clinical picture of diabetes. Moreover, disturbance of these several grades may be induced in different cases by one and the same cause, or in the same case at different times. The effect of this, says Garrod, is to obliterate in one's mind the conception of diabetes as a sharply defined disease, and to present the malady as merely the maximal phase of a series, rising by gradual steps from the normal of metabolism, just as myxedema is the culminating point of the almost insensible grades of hypothyroidism. Between the sufferer from grave diabetes and the potential glycosuric there is a striking contrast, but the gulf which separates them is bridged over by intermediate cases of all degrees of severity. If so, it follows that, with the possible exception of the so-called renal glycosuria, there is no such thing as non-diabetic glycosuria, although there are many varieties which lack the sinister import which we connect with the name of diabetes. The differences are, Garrod believes, rather of degree than of kind. Diabetes is not of necessity a fatal malady. The efficacy of restriction of diet, which has ameliorated the lot and prolonged the lives of hosts of sufferers from diabetes, although it is essentially a symptomatic therapy, is due to the fact that it is the metabolic derangement which proves fatal to most of these patients.

Bronzed Diabetes. A case is reported by Labbe,² the patient having been a previously healthy woman who began to suffer from intense

¹ *Lancet*, March 9, 1912.

² *Archives des Maladies de l'App. Digestif.*, Paris, July, 1912.

thirst and during the following months gradually grew weaker and lost flesh, while sugar appeared in the urine. The glycosuria subsided on dieting at first, but later persisted unmodified, with other symptoms of diabetes and bronzing. The necropsy findings confirmed the assumption of diabetes from cirrhosis of the liver and pancreas, plus the pigmentation. The disease seems to have originated in some toxic process of unknown origin. The blood-destroying and sclerosis-producing action of this process caused in turn, on the one hand, a hemolytic jaundice followed by hemosiderosis, and, on the other hand, cirrhosis of liver and pancreas. These lesions became clinically manifest in the pigmentation and the diabetes.

Potter and Milne¹ have made a careful clinical and postmortem study of a case of bronzed diabetes, and, from this and what they could glean from the literature, they are led to believe that today we are warranted in stating only that the cirrhosis of the liver is primary in this condition; that pancreatic involvement with diabetes is a sequence or coincident event to this; that the hemochromatosis, always in slight degree in liver cirrhosis, is in some cases very excessive and causes a general pigmentation which eventually also involves the skin; and finally, that the whole process is not any definite symptom-complex, but a chain of circumstance which rarely seems to be completed.

Association. From a detailed and extensive study of the *association of diabetes and tuberculosis*, Montgomery² is led to the conclusion that it has not been definitely proved that tuberculosis occurs more frequently in diabetes than in the general population at the same age periods. The author, however, is impressed by two facts: (1) The lowered opsonic index to the tubercle bacillus and a number of other bacteria in diabetes; and (2) the large number of cases of diabetes late in the course of the disease developing a very acute, extensive, and rapidly fatal form of pulmonary tuberculosis. Tuberculosis occurs more frequently in diabetes than in some other chronic diseases. The frequency of tuberculosis in diabetes varies with a great variety of different circumstances. In the writer's 25 collected autopsies on diabetic patients, 6 showed active pulmonary tuberculosis varying in acuteness and extent of involvement, and 1 showed adrenal tuberculosis without tuberculosis elsewhere. Out of 355 autopsies collected from the literature since 1882, including also the writer's 25 cases, 138 (38.9 per cent.) revealed pulmonary tuberculosis, mostly in an acute form. In some structures, for example, the bones, the writer could not find a single case of tuberculosis in a diabetic patient.

The frequency of diabetes in cases of tuberculosis is fairly well represented by the table presenting 31,834 cases of pulmonary tuberculosis, of which about $\frac{1}{3}$ per cent. had glycosuria, and between $\frac{1}{6}$ and

¹ American Journal of the Medical Sciences, January, 1912.

² Ibid., October, 1912.

$\frac{1}{3}$ per cent. had diabetes. Five cases of diabetes were found in 937 autopsies on tuberculous patients.

Of the cases studied by Montgomery,¹ he makes a special report of one, a case of *Diabetes Mellitus Associated with Tuberculosis of the Adrenal Glands*. The author was able to find only two reports in the literature of an association of this kind (Ogle, St. George's Hospital Reports, 1866, vol i, 178; Rabé, Cirrhose hypertrophique pigmentaire d'origine diabétique, Bell. Soc. anat. de Paris, 1900, p. 459). In the author's case, the association of the diabetes and the adrenal tuberculosis seemed to be a mere coincidence, and there was no evidence to show that any causal relations had existed between the two diseases. The adrenal tuberculosis in this case was not only primary, but the only tubercular focus found at autopsy.

Emerson² has studied the occurrence of *Glycosuria among the Insane*, and the facts gleaned are epitomized as follows: The sugar reaction is frequently obtained in the urine of the insane, especially of melancholics and those with organic brain lesions. The condition is usually a temporary one occurring at more or less frequent intervals or only during the first few days after admission. The permanency of the glycosuria, the specific gravity, polyuria, thirst, neuritides and ammonia output, should be considered in differential diagnosis. If the sugar is abundant and present over a considerable period of time, antidiabetic management should be instituted. The importance of the sugar test must not be underestimated in view of the resemblance symptomatically of the diabetic psychosis and melancholia.

The discussion of the cause of the frequent appearance of sugar in the urine of the insane can be but speculation. Certain factors of instigation are recognized. The mental agitation and distress experienced by many who have insight into their condition explains the occurrence of glycosuria on admission. The gluttony, especially common among epileptics, is responsible, in all probability, for frequent temporary appearance of sugar.

Treatment. In the treatment of glycosuria, Funck³ lays stress upon *finding an underlying cause and directing treatment against it*. The evidence today points to constitutional inferiority of the glands in charge of carbohydrate metabolism, particularly the pancreas. The pathologic factor responsible for this inferiority may act on these glands directly or indirectly by inhibiting vicarious action of certain other organs or function. This factor which determines the disturbance of these glands is to be sought out and its influence removed. He cites a number of cases illustrating this point. In one, a woman aged thirty eight years, a chronic catarrhal bowel trouble was the

¹ Journal of the American Medical Association, March 23, 1912.

² Ibid., December 21, 1912

³ Med. Klinik., 1912, Nos. 33 and 34.

primary cause of symptoms of diabetes and neurasthenia for about two years. Under treatment for the bowel trouble, the sugar in the urine dropped in eighteen days from 200 grams to zero, and did not return during the succeeding year, although there were no restrictions in the matter of diet. Funck calls attention to the information liable to be obtained by examining the urine voided at different times of the day. Curves may thus be obtained which suggest a clue to the primary factor. In one case, the sugar output seemed to be due to a reflex act elicited after each meal by the presence of food in the stomach. The proportion of sugar at 10 A.M. was 0.4 per cent. Fifteen minutes after dinner there was sudden desire to urinate, and the proportion of sugar gradually increased to 1.1 per cent. by the third hour. Examination four years before had shown 2.6 per cent. in the total urine. The patient was a man, aged forty-six years, and after a course of feeding exclusively by the rectum, to avoid the reflex influence from food in the stomach, he was freed entirely from the glycosuria. Now, nearly a year later, he can eat starchy foods and nearly a quart of milk a day, up to 2300 calories without any further sugar in his urine. In the third case, the diabetes accompanied in a child, aged two years, an inherited, almost absolute, insufficiency of the digestive apparatus. Achylia gastrica is not unusual in diabetics. In some cases the metabolism may be upset by an excessive protein diet; in others, the tendency to diabetes remains latent until aroused by some excess in eating, an exacerbation of an old colitis, for example, as in a case described. There was usually complete tolerance for carbohydrates, but three or four days after a banquet, from 0.2 to 0.4 per cent. of sugar was found in the urine voided after dinner. Large doses of tannin, rinsing out the intestines and a frugal starch "colon diet," with abstention from meat for three or five days, put an end to the glycosuria each time. Others have recently reported the permanent subsidence of glycosuria under lavage of the stomach, dietetic treatment of enteritis, treatment of neurasthenia, salvarsan treatment of a syphilitic pancreatitis with 5.4 per cent. sugar, or thyroid treatment or treatment of uricacidemia. We have no criterion as yet to determine whether the diabetes is still in its first stage, that is, still amenable to treatment directed to removing the cause. After this stage is past, then the ordinary measures in vogue are applicable alone. The only safe way is to take it for granted that the diabetes is still in the first curable stage and spare no pains to discover the causal factor in the digestive tract, liver, sympathetic system, thyroid or epinephrin-producing glands.

Cammidge¹ has worked out a *system of rations* for use in the dietetic handling of diabetics which, although it may appear cumbersome, should work out easily and well in practice. We will quote extensively from his paper: "What is really wanted is an adjustment of the food

¹ British Medical Journal, October 12, 1912.

to the capacity and needs of the organism, quantitatively as well as qualitatively. This can only be done by a thorough investigation of the metabolism of each case, based upon a series of analyses of the urine and feces when the patient is taking a diet of known composition.

"Having discovered the carbohydrate tolerance of the case under consideration, and the particular forms of carbohydrate that are best suited to his idiosyncrasies, he is allowed to take each day a quantity of one of these starchy foods that is within his limit of tolerance. It is quite unnecessary, and is indeed often harmful, to keep a patient on a strict carbohydrate-free diet for more than a brief period; I have seen so many difficulties result from it that I cannot too strongly urge the necessity for an early adjustment of the carbohydrates of the food to the tolerance of the case.

"The experiments of most investigators have shown that the energy requirement in diabetes is little, if at all, altered from the normal, for the diabetic condition does not involve an increase in the quantity of energy produced, but only an alteration in its source. We may therefore take it that a person with glycosuria requires 34 to 35 calories per kilogram of his body weight daily (that is, between 15 and 16 calories per pound), although in some instances it will be found that 25 or even 20 calories are sufficient to maintain the patient's condition. The carbohydrate that can be given will often only provide a small proportion of the required energy, and the balance has therefore to be made up with proteins and fats. It is by no means a matter of indifference which of these is used, since a large protein intake raises the metabolic level of the body, causes the formation and excretion of a large quantity of partly oxidized waste products, thus throwing extra work on the organs of metabolism and excretion, and is liable to give rise to constipation, one of the worst enemies of the diabetic. It is one of my most common experiences to have sent to me a diabetic patient who has not done well on an ordinary carbohydrate-free diet, and on examining the urine to find that the total nitrogen excreted is considerably in excess of that contained in the food. On readjusting the diet so that nitrogenous equilibrium is established, a rapid improvement usually follows.

"With these ideas in mind, I have worked out a system in which the diet is arranged in 'rations' of approximately equivalent energy value, taking as the basis an average serving of roast beef, which weighs 3 oz. and is calculated to yield 300 calories. The same amount of energy is, for instance, provided by $3\frac{1}{4}$ oz. of mutton, $3\frac{3}{4}$ oz. of ham, $5\frac{1}{2}$ oz. of chicken, $4\frac{1}{4}$ oz. of duck, $8\frac{1}{4}$ oz. of halibut, $10\frac{1}{2}$ oz. of cod, $5\frac{1}{2}$ oz. of salmon, 4 average eggs, and by substituting any one of these for the beef we can be sure that the patient is receiving about the same amount of energy. It will be noticed, however, that there is a very considerable difference in the weight of the 'rations,' and that some

are in excess of what would be readily consumed by an average person, but by giving half or quarter 'rations,' and using two or more, the calorific value is maintained, while a greater variety can be introduced into the diet. The use of fractional rations for some foods also avoids the difficulty of too much protein being taken, for while 3 oz. of beef contain 18.7 grams of protein, $5\frac{1}{2}$ oz. of chicken contains 53.3 grams, and $10\frac{1}{2}$ oz. of cod about 66 grams; by giving half rations of chicken and quarter rations of cod the protein works out at about 26.6 and 16.6 grams respectively. The protein portion of the diet should be so arranged that the patient is in nitrogenous equilibrium, or there is a slight retention of nitrogen.

"The administration of the requisite quantity of fat is facilitated by arranging the predominantly fatty foods in rations on the same plan as the proteins, keeping to the unit of 300 calories. This amount of energy is supplied, for instance, by $1\frac{1}{2}$ oz. of fat bacon, $1\frac{1}{2}$ oz. of butter or margarine, 1 oz. of olive oil, $3\frac{1}{2}$ oz. of rich cream, $2\frac{1}{2}$ oz. of Cheddar cheese, etc., which can, of course, be given in fractional portions when the full ration is excessive. Bacon, cheese, and cream are usually well taken, and can be arranged to supply a considerable proportion of the energy required, but it must be remembered that, although Cheddar cheese contains about 37 per cent. of fat, it also contains about 28 per cent. of protein, which must be allowed for in arranging the nitrogenous part of the diet. A certain amount of butter or, better, good margarine, and a few Brazil nuts, which contain about 67 per cent. of fat, can be arranged to give another 400 or 500 calories. Salad oil is a most useful food for diabetics, and can be conveniently given with sardines. It is often necessary, however, to introduce more butter, salad oil, etc., into the diet than most patients will tolerate when they are having little or no bread, but this difficulty can be overcome by giving the former in the form of oiled butter with the coarser vegetables that contain less than 5 per cent. of carbohydrate, such as cauliflower, cabbage, turnip, spinach, asparagus, French beans, mushrooms, etc., as a salad dressing with raw vegetables such as lettuce, tomato, cucumber, radishes, celery, etc., which also contain under 5 per cent. of carbohydrate. By instructing the patient not to take more than a definite amount—which for my work I arrange as the quantity containing 1 gram or less of carbohydrate—we can be sure that not more than 1 or 2 grams of carbohydrate are being derived from this source. As a rule, probably less than this amount is actually absorbed from the raw vegetables.

"In cases in which the tolerance for carbohydrates is fairly well maintained, further variety can be given to the diet by allowing a fixed quantity of certain fruits that contain a comparatively small proportion of carbohydrate. Among the commoner fruits containing 10 per cent., or under, are blackberries, bilberries, cranberries, lemons, pine-

apple, rhubarb, water melon, etc. By arranging these in rations which contain 5 per cent., or less, of carbohydrate, and instructing the patient not to exceed a definite daily amount, we can keep control of his carbohydrate intake and make certain that his limit of tolerance is not being exceeded.

"With regard to 'diabetic' breads and bread substitutes, a small quantity of a thoroughly reliable brand is often useful as a vehicle for the administration of fatty foods, particularly butter and cheese.

"When a diet that suits the patient has been worked out, and the quantities of carbohydrate, protein, and fat necessary to supply the energy required have been determined, I give to my patients a specimen diet chart on the back of which are lists of the protein, fatty, and carbohydrate foods worked out in rations. They are instructed that they may substitute for any one article in the diet an equivalent amount of any other foodstuff, of the same class, from the list on the back, but that the daily total 'food value' must always work out approximately the same. To avoid the difficulty of manipulating fractions when dealing with portions of a ration, I give to the full ration the value of one hundred and to portions corresponding values.

"In cases in which it is found that nitrogenous equilibrium is easily disturbed, it is advisable to prescribe a purely vegetable-fat diet for a few days at regular intervals. The semistarvation which this entails has a beneficial effect, as a rule, on the patient's powers of utilizing both carbohydrates and proteins.

"I am firmly convinced that just as a radical surgical operation is the only reliable means of prolonging life in malignant disease, so in diabetes a thorough quantitative reorganization of the diet, based upon metabolic experiments, is the best method by which the patient can be offered a fair prospect of escaping the serious, and often dramatically fatal, complications to which his disorder renders him liable."

There has been a wealth of literature during the year on the *oatmeal cure*, and the use of *vegetable days* or *carbohydrate days in the treatment of diabetes*. The general conclusion adopted from practically all of these papers is that the value of such a procedure lies in the fact that these are relatively starvation days, and the patient's metabolism consequently is being rested.

Strauss¹ has derived great benefit from an occasional fluid day in the treatment of severe diabetes. He permits the patient on that day to take nothing but tea, coffee, bouillon, mineral waters, wine, or brandy. He sometimes allows oranges with this "drink day", and says the advantages of this combination and of the occasional day of restriction to fluids are not generally appreciated as they should be. Strauss²

¹ Deutsch. med. Woch., March 7, 1912.

² Berliner klinische Woch., June 24, 1912.

further observes that advantages are to be derived from the use of inulin in the treatment of diabetes. He has been using this systematically in 9 cases and tabulates the metabolic findings giving the daily details during the two or three months of the tests. The inulin was given pure, 100 grams a day mixed with the food. He found that this was perfectly tolerated, except possibly by one moribund patient. No intestinal disturbances were observed, and the patients increased in weight. The patients continued to take the inulin over periods of five, seven, or fifteen days at a time, and a consequent beneficial influence on the acidosis was evident. The best results were obtained with periods of from four to eight days with varying intervals, the inulin being mixed with eggs, fruits, or vegetables. The author does not approve of giving the inulin in bread, as the bread may contain substances which are not so well tolerated. The use of inulin is indicated in moderately severe and very severe cases, especially those of acidosis.

Hanssen¹ warns that the *administration of sodium bicarbonate* in large doses is not free from danger. He gives the details of 6 cases in addition to two which he had previously published. He studied these diabetics in relation to the weight, albuminuria, and coma, when on large doses of sodium bicarbonate. Three of the 6 patients had convulsions following the injections. In one, a man aged twenty-seven years, the coma subsided under the influence of the alkali given by the mouth and by intravenous injection. The coma returned after two months, and at this time no influence was apparent from the use of the alkali, and the patient succumbed from respiratory arrest immediately after the infusion. In the other cases, death occurred immediately, or four or ten hours later. Hanssen² further presents evidence to show that while the bicarbonate of soda may arrest coma in diabetes, this effect is only temporary. The coma is merely postponed, and is sure to return sooner or later. The alkali, he finds, has a pronounced effect on the body weight, which is probably due to the retention of water. Among 15 cases he found that the weight increased from 0.1 to 12.4 kilos in from one to eleven days. In 8 cases of coma he gives the necropsy findings, and, in every case, extreme hyperemia with edema in the meninges of the brain was found, accompanied by hemorrhages in 5 cases. Albuminuria was a constant finding in the severer cases of diabetes, but this subsided regularly under the influence of the alkali.

THE THYROID GLAND

Experimental Hyperthyroidism. Considerable experimental work has been carried out upon the thyroid during the course of the year, and

¹ Norsk Magazin f. Laegevidenskaben, Christiania, May, 1912.

² Zeitsch. f. klin Med., October 12, 1912.

has led to various, and oftentimes contradictory, findings. Klose,¹ working in conjunction with Lampe and Liesegang in Rehn's clinic, has carried out extensive researches upon the thyroid. Their work is presented in an exhaustive article in which they attempt to establish exophthalmic goitre as a surgical affection. They say surgery has proved that the thyroid gland is the cause of Basedow's disease (thyrotoxicosis). This disease is a surgical disease, and future investigations will group themselves around the question, Is this a hyper- or a dysthyreosis? They found that the intravenous injection of the juice pressed from a fresh Basedow gland brings about, in the experimental animal, an acute disease, severe in type, and usually running its course in six days, characterized by high fever, tachycardia, nervous symptoms, the presence of albumin and sugar in the urine, sweating, falling of the hair, glycemia, and exophthalmos. The juice pressed from a normal thyroid gland, or from a simple goitre, when injected into the experimental animal, even in large doses, was found to produce no result. They likewise found that the intravenous injection of potassium iodide in susceptible or suitable experimental animals (those with an unstable nervous system) gives rise to a condition which is analogous to that observed following injections of juice from a Basedow gland. Basedow's disease in man, they conclude, cannot depend upon a hypersecretion of the normal gland substance, but the disease is a specific poly-tropic and chronic intoxication, with a qualitatively changed thyroid secretion. This dysthyreosis can arise through the action of a masked iodine, which they designate as Basedow iodine. The Basedow thyroid gland is no more powerful than the iodine which is taken in with the food and changed into thyreoglobulin. The iodine is stored in a masked state, and is given off in the body as such. The Basedow iodine chemically stands much nearer to inorganic iodine than does thyreoglobulin. Their study showed that the erythrocytes in Basedow's disease revealed no important deviation from the normal. The leukocytes, however, showed a constant change, either a relative or an absolute lymphocytosis. The presence of a leucopenia (Kocher) or mononucleosis (Cara, Gordon, Jagie) was not noted. The leukocytic blood-picture they considered of high diagnostic and differential diagnostic worth. It appears to them entirely unjustifiable to look upon the disappearance of the lymphocytosis as a criterion of cure in Basedow's disease. The leukocytic blood-picture changes little or none in the sense of an improvement through therapy, whether this be external or internal. The blood-picture in Basedow's disease is not dependent directly on the thyroid gland, but upon some other organ. In addition to the morphological changes, there are biochemical changes which take place in the blood, the coagulation time is delayed, and the freezing point is lowered. The viscosity, however, shows no change. In addi-

¹ Bruns' *Beitrag z. klin. Chirurgie*, Band lxxvii, Heft 3.

tion to an adrenalinemia, there often occurs a glycemia without glycosuria. The sugar content of the blood often reaches double the normal. They look upon the increase in the lymphocytes, large and small, as a characteristic of Basedow's disease, yet this characteristic they consider not dependent directly upon the thyroid gland. The product of the disfunctionating gland (Basedow iodine) injures the interstitial substance of the genital glands and, in consequence of this occurrence or because of a reduction of the internal secretion of the genital glands, there takes place a revivification or hyperplasia of the thymus gland, and it is upon the thymus gland that the lymphocytosis in Basedow's disease depends—whether it be that the internal secretory product of the thymus exerts a direct stimulation upon the lymphatic system, or that the lymphocytic increase is called forth through the action of vagus tone. By operation for Basedow stroma, the thymus gland can be influenced only through a regeneration of the interstitial substance of the genital glands which has been injured by the thyroid secretion. This can seldom be the case, for, among the cases which generally come to treatment by the surgeon, we must assume that the injury has already gone too far. On the other hand, it must be taken into consideration that a once-established hyperplastic thymus now acts as a depressor upon the genital glands. Thus is explained the persistence of lymphocytosis after operation. Through this assumption of injury to the genital glands in Basedow's disease, the fact that the epiphyses in growing bones remain open an abnormally long time, as determined by Holmgren, may find its explanation. Perhaps it is also true that the increased size of the hypophysis, which is so often found in Basedow's disease, is also dependent upon injury to the genital glands.

Baruch¹ criticises the findings of Klose and his co-workers in their method of using the expressed juice of the thyroid gland, claiming that the active principle which calls forth Basedow's symptoms is often absent from the expressed juice or, if present, only in small amounts. Baruch used a brew of the freshly removed gland. Usually the gland was of the parenchymatous type, and seldom of the colloid type. At first he injected, by means of a syringe and a large calibrated needle, the finely divided gland into the peritoneal cavity or under the skin. These experiments, however, produced no results. He then gave intraperitoneal injections of a brew of the glands. In this manner he produced Basedow symptoms in a whole series of dogs, as well as in rabbits and rats. The dogs developed a restlessness and a very nervous disposition, rapidly lost weight, and some of them suffered from marked falling of the hair and diarrhea. Later, tachycardia, glycosuria, lymphocytosis, and, in some cases, a distinct exophthalmos developed. He found the experiments to be more successful in young females.

¹ Centralblatt f. Chirurgie, March 9, 1912,

He injected from 5 to 20 c.c. of the brew usually more than once, and at intervals of about eight days. He calls attention to the fact that his experiments, and those of Bircher, show that gland material from those not suffering with Basedow's disease is capable of producing the disease in animals, a finding that does not agree with that of Klose.

Bircher's¹ experiments consisted of implanting pieces of thymus gland in the abdomens of dogs, the thymus having been removed from patients who showed no signs of exophthalmic goitre. This abdominal implantation of the thymus induced typical exophthalmic goitre in the animals, the exophthalmos being especially pronounced.

Klose and Lampe,² in replying to Baruch's criticism, defend their experimental procedure, and in turn point to the probability that the resulting phenomena in Baruch's experiments were due to anaphylaxis, he having used two or more injections of a brew of the thyroid gland (foreign proteid).

Bardenhewer³ also criticises Klose's results, stating that the results of his experiments corresponded in no way with those of Klose. He found that injections of a 0.1 per cent. solution of potassium iodid in water, in a dose of 0.03 per kilo of body weight (recommended by Klose), did not result in a rise of temperature, but, on the other hand, produced a slight unimportant fall. The pulse rate was practically unaffected, and only twice was there a slight irregularity to be noted. Jerky breathing, general body tremors, sweating, severe nervous phenomena, attaining even to convulsions, as noted by Klose, were entirely absent in both experiments. There was no widening of the palpebral fissure nor of the pupils, and no exophthalmos. Tests for albumin and sugar in the urine, which Klose found positive, were regularly negative. The blood picture of Basedow's disease (Kocher formula) which Klose said followed the injection of potassium iodide in his experiments, did not appear in the author's experiments. The author concludes, therefore, that it is not permissible to say that Basedow's disease is an intoxication with inorganic iodine as Klose claims. In connection with the consideration of iodine as a factor in the production of Basedow's disease, it is interesting to note that Pulawski⁴ reports 3 cases of goitre in which Basedow's symptoms developed under treatment with iodine or thyroid. He states that these symptoms persisted in one case long after the treatment had been discontinued.

Lepine⁵ also reports a case in which hyperthyroidism developed following the use of iodine in a gynecological operation.

¹ *Centralblatt f. Chirurgie*, vol. xxxix, No. 5.

² *Ibid.*, May 11, vol. xxix, No. 19.

³ *Archiv f. klin. Chirurgie*, vol. xcii, No. 3.

⁴ *Méd. de Clinie*, July 21, 1912.

⁵ *Revue de Médecine*, July, 1913.

Carlston¹ summarizes the basis for the prevalent view of hypersecretion of the thyroid in Basedow's disease as follows: (1) Structural changes in the thyroid; (2) the effects of partial extirpation of the gland; (3) the aggravation of the symptoms by thyroid administration; and (4) the alleged reduction of some or all of the symptoms in healthy individuals and experimental animals by thyroid administration. According to Carlston, the most constant results in animal experiments where thyroid feeding is used are loss of body weight, gastro-enteritis, and diarrhea. Carlston found that thyroid feeding in distinctly toxic quantities did not produce tachycardia, and, to quote him, "Neither does the feeding result in nervousness nor exophthalmos in any of the groups (of experimental animals). The animals usually retain their appetite and will feed until the gastro-enteritis is extreme or the animal is moribund. In view of our results in so many animal groups, it would seem that the records of exophthalmos obtained by previous observers by thyroid feeding are based on errors of judgment, and that the nervousness and tachycardia similarly described are due to some other factors than the thyroid feeding. This is clearly the case in some instances from the accounts of the experiments given by the authors themselves. It would require considerable imagination or an undue influence of one's wish or close judgment to identify the symptom-complex of excessive thyroid feeding in experimental animals with the exophthalmic goitre syndrome in man. The symptoms, in experimental animals, may, or may not, be an expression of hyperthyroidism. Other lines of investigation must determine that point. The symptoms are not those of exophthalmic goitre. It would seem that man is very much more susceptible to thyroid feeding than any other species so far subjected to experiment. Because of this fact, and in view of the higher or more delicately balanced nervous organism in man, the expression of hyperthyroidism in man may differ from that in the lower animals."

Pathological Anatomy. A. Kocher,² in a voluminous article on the histological and chemical changes in the thyroid with exophthalmic goitre which appears from Kocher's clinic in Berne, concludes that the exact histological examination of the thyroid gland in Basedow's disease reveals, without exception and in accordance with the clinical picture, differences from the structure of the normal gland, and from that of simple goitre. The proper valuation of the histological changes is important in order to approach the microscopic and chemical findings. In the majority of frank cases, one can recognize the character of the histological changes at each cut, but a positive judgment of the case is only arrived at through prolonged examination of the preparation. The Basedow changes affect, almost without exception, the whole

¹ American Journal of Physiology, vol. xxx, p. 129.

² Virchow's Archiv, April, 1912.

thyroid, and they are rapidly or slowly progressive. The changes in the gland consist chiefly in an enlargement which is always present. The assumption that Basedow's disease occurs without an enlargement of the gland should now finally be given up after this condition has been found without exception in 800 well-defined cases, including those in which the enlargement had not been recognized clinically. This enlargement is very variable and is not always proportionate to the grade of the disease. The liquefaction and decrease of the contents of the follicles point to an increased absorption, and the accompanying increase in cell size is to be explained as an expression of the increased cell metabolism. If we consider the etiological factors, which may be divided into the neurogenous, acting by way of the *nervi vasorum* and eventually through the secretory nerves, and the toxic (chemical and infectious), in their action upon the thyroid gland, we find they bring about first of all a hyperplasia and, as a consequence of this the changes in the follicle contents and the cells occur. Rapid absorption of the quantitatively and qualitatively changed contents of the follicles is constant in Basedow's disease. By quantitative and qualitative changes are meant increased or concentrated, or increased and concentrated follicle contents. The change in the Basedow thyroid progresses still further after this initial stage. It progresses when the stored follicle contents are all absorbed. It is characteristic that, in colloid glands in which the disease is not very acute or rapidly progressive, one finds follicles from which the contents have disappeared, and neighboring follicles from which all the stored material has not been absorbed. Where this is the case, however, the cell change is still progressive. When all of the stored material is absorbed from the gland, the hyperplasia and cell change progress, and the phenomena of the disease persist. The question arises whether this progressive change can be taken simply as a compensatory hyperplasia. The deficiency of follicle contents or colloid can act as a stimulus to hypertrophy through the increased demand which its lack gives rise to. If this is so, it gives rise to a vicious circle. Meanwhile we are concerned histologically, by no means in all cases or even in the majority, with what we may designate as a true hyperplasia. We recall the infrequency of the regeneration of follicles, the irregular cell proliferation, the nuclear changes, the proliferation of the lymph tissue, and the cell atrophy. We must, in addition, assume that a change is brought about in the gland parenchyma proportionately to the influence of other injurious conditions. Compensatory hyperplasia is not a sufficient explanation for the progress and duration of the symptoms. The absorption of the quantitatively or qualitatively concentrated colloid acting as a toxin gives rise to an abnormal stimulus or irritation which influences the gland parenchyma. This toxic irritation at the same time acts upon other organs which react upon the thyroid gland. This

has been shown through a series of interesting experimental findings, especially on the other ductless glands (Eppinger, Falta, S. Kostlivy, Newburgh, Nobel, Pettavel, Schweeger, Wiener, Schmorl). It is, therefore, well to assume that where a renewed cause of irritation is absent, the duration and progress of the changes in the thyroid gland, and especially the symptoms of the disease, are due to a vicious circle which occurs on the one hand in the thyroid gland itself, and, on the other hand, through other ductless glands. The progressive change in the thyroid gland occurs in different ways; sometimes a true hyperplasia or more or less irregular cell proliferation, sometimes a more or less extensive nuclear change and cell atrophy; at other times, hypertrophied cells filled with secretion showing no nuclear change, very often with the formation and proliferation of lymphoid tissue. The different changes can exist side by side in the same Basedow gland. If, in addition, we consider that the other ductless glands, through whose medium further injury has been wrought on the thyroid, now are in a different condition from that in which they were before the onset of the disease, we must come to the conclusion that in this disease we are concerned with a very complicated disturbance of function of the thyroid gland. Abundantly rapid or sudden absorption of the more or less increased or concentrated gland-material, with more or less hyperplasia or hypertrophy associated with partial atrophy and degeneration of the parenchyma, along with the failure of the follicles to store new material, constitute the characteristic changes in the Basedow thyroid. From this, we must conclude that, clinically, the disease takes different forms and courses, and we have found clinical differences corresponding to these changes in the gland. From the above we are justified in speaking of an abnormal function of the gland in Basedow's disease either of a quantitative or qualitative nature. It does not seem justifiable to us at present to contest for either a hyperthyreosis or a dysthyreosis. They are only names, but in no sense a clear definition. When once we know what part of the thyroid gland function is carried out in the cells, what part is played in the lumina of the follicles, and what significance attaches to the storing of material in the follicles, then we will be able to judge somewhat more precisely as to the nature of this disease.

MacCarty¹ has made a study of 2500 specimens of the thyroid removed at operation and examined in a fresh state. He comments upon the degree to which speculation has covered our perception of the pathology in the past. The conclusions reached from his study are that the gross and microscopic pathology teaches that the condition which we call goitre, at least in its more advanced state, is something more than a localized condition. The thyroid itself is but a part of a pathological complex which makes up a clinically complex picture,

¹ New York State Journal of Medicine, October, 1912.

especially in hyperthyroidism. In spite of the excellent research which has given us a clear idea of goitre, very little is known about the etiology, or indeed the physiology, of the gland itself. New paths of research should be utilized in conjunction with the research which has already been done. The field should not be discouraging, but filled with the greatest and brightest interest and possibilities, because it involves something more than experimental research in chemistry and surgery. It involves, first of all, the discovery of an experimental animal with a patent thyroid duct from which secretion may be obtained.

Pettavel,¹ from an exhaustive clinical and pathological study of four cases which died after operation and were examined postmortem, concludes that Basedow's disease, in certain cases, shows anatomical changes in the glands with an internal secretion which in all probability is accounted for by the disturbance in the inter-relationship of these glands. In a well-defined case of Basedow's disease, the islands of Langerhans showed degeneration, with necrosis and lymphocytic infiltration. In this case, there was a marked alimentary glycosuria, and small amounts of glycogen were found in the kidneys. The adrenals of all four cases showed microscopically cellular hypertrophy of the medulla, which consisted in the appearance of numerous large cells with very large nuclei, rich in chromatin. In the combination of Basedow's disease with status lymphaticus, this hyperplasia of the adrenal medulla is not so marked and in part may be masked. In the four cases investigated, the status lymphaticus was constant. In one of these cases, however, it was of a mild grade. Well-defined status thymicus occurred in only two cases. The microscopic picture here pointed to a persistence of the thymus rather than to an actual hyperplasia.

Etiology. The tendency of the year seems to be a drifting away from the theory of hyperthyroidism, and an attributing of the symptom-complex of exophthalmic goitre to a more widely distributed cause. All of the conspicuous utterances of the year apparently are to this effect, although the opinions by no means coincide.

Dock² thinks that although the term hyperthyroidism is useful, there is danger of trusting too much in it and of being contented with the belief that a modern term supplies an explanation of the pathology. He inclines to the view of perverted function of the thyroid as against hyperfunction, and thinks that we should seek for an evidence of more than hyperthyroidism both clinically and anatomically. He suggests a still more serious objection to the term in that it tends to make us overlook the participation of other glands with internal secretions in all thyroid disease. That other glands are affected in function in varying degrees must not be infrequent, and this fact should act as a

¹ Deutsch. f. Chirurgie, vol. cxvi.

² New York State Journal of Medicine, September, 1912.

guide to our observations and explanations of symptoms. To him, as the term hyperthyroidism spreads, the idea of an association of ductless gland diseases becomes less prominent in medical literature. He thinks, as Marine and Lenhardt have claimed, that myxedema does not precede exophthalmic goitre, but he questions if this is true of all hypothyroid states. He evidences the improvement of some cases of exophthalmic goitre under thyroid or iodine treatment, and wonders if it is not possible, in these cases, that a degenerative lesion or hypofunction caused the hyperfunction, and that the specific treatment thus brought improvement even when it was not used as a specific treatment. When we consider the liability of the thyroid to rapid change, how it swells and shrinks within a few hours, we must realize that it can quickly begin to compensate for the lowered function in a part and that, in so doing, it may overcompensate, producing symptoms that may early mask those of depression.

Along the line of thought expressed by Dock, Hoover¹ says that all the known evidence shows that when the thyroid varies from the normal type, the change is toward hypothyroidism rather than hyperthyroidism. If the hyperthyroid patient develops an atrophy of the thyroid instead of the colloid state, then all the symptoms of myxedema or hypothyroidism appear, and the symptoms of Graves' disease or hyperthyroidism remain unchanged. He believes that while one may be justified in claiming a relation between goitre and hypothyroidism, there is no justification in claiming a relation between the frequency of goitre and hyperthyroidism.

The results of Oswald's² research into the subject of Basedow's disease leads him to think that, in addition to the thyroid, there is a nervous factor playing its part in exophthalmic goitre. The sympathetic and cerebrospinal nervous systems are both subject to the action of the thyroid secretion, as proved by experiment, but, when these systems are sound, the secretion has no clinically demonstrable injurious influence on them. However, when either is diseased or in an irritable condition, then the products of a hyperfunctionating thyroid act upon them in an irritating manner. This action of the sympathetic system in turn stimulates the thyroid and heart to increased functioning, and thus a vicious circle is started which constantly aggravates the morbid conditions and gives us the clinical picture of Basedow's disease. Removal of the thyroid gland does away with this retro-active influence which magnifies the irritation from the original cause, and the sympathetic system being relieved of this burden grows less irritable as a consequence of the operation. This same conception explains the development of exophthalmic goitre following infectious disease. The condition never

¹ Ohio State Medical Journal, Columbus, July 15, 1912.

² Correspondenzblatt f. Schweizer Aerzte, October 20, 1912.

develops except where persons have predisposed nervous systems. This predisposition is exceptional in regions where simple goitre is endemic. Hence endemic goitre seldom passes into the Basedow form. The feeding of thyroid extract does not elicit Basedow's symptoms, excepting where this predisposition exists. Oswald regards the thymus as a further aggravator of the original morbid condition. When this gland persists, the individual is in greater danger from his exophthalmic goitre. The constitutional anomaly which manifests itself in a persisting large thymus, with possibly hypertrophy of the lymphatic system, indicates a low grade of resisting power on the part of the organism, which is thereby more liable to injurious influences from within or without, especially those affecting the heart. Hence removal of the thymus in such a condition does away with one of the noxious factors and helps to break up the vicious circle. This alone has been sufficient, in some cases, to exert a cure. Oswald asserts that a persistent thymus is always present in Basedow sufferers who die of the disease or during operations on the thyroid.

Matti¹ has made a study of 10 cases of exophthalmic goitre who died during, or soon after, operation on the thyroid. In addition to this, he has analyzed 133 cases of similar character taken from the literature. In all of his 10 cases, and in 76.5 per cent. of the cases from the literature, the thymus gland was not only persistent, but unusually large. He believes that the thyroid and the thymus act together, and that the action of either one aggravates the morbid condition produced by abnormal function of the other. There is evidence, from these cases, that the adrenal functions are depressed by excessive or perverted functioning of the thymus. The adrenals, in all of Matti's ten cases, were very small. The study has suggested to the author that when cases for thyroid operation are known to possess an enlarged thymus, a preliminary operation on the thymus, accompanied by the administration of epinephrin, might be useful.

Melchior² concludes, from his own experience and the literature on the subject, that fully 80 or 90 per cent. of the cases of exophthalmic goitre are accompanied by an unduly large thymus. He believes there is no evidence that the thymus exerts any toxic action, but suggests that the status thymicolymphaticus may represent a special reaction of the tissues excited by an overfunctioning of the thyroid. To his mind, thymus death is simply a pure heart failure, due to that organ having suffered for a greater or less period of time from the toxic action of the diseased thyroid gland.

Lenormant³ believes the real danger in exophthalmic goitre is not due alone to hypertrophy of the thymus, but to this hypertrophy in

¹ Deutsch. Zeit. f. Chirurgie, vol. cxvi.

² Centralblatt f. d. Grenz. d. Med. u. Chir., vol. xv, No. 3.

³ Jour. de Chirurgie, September, 1912.

association with hypoplasia of the adrenals and a consequent instability of the cardiovascular system.

Cohn and Peiser¹ have investigated the association of exophthalmic goitre with disease of the pancreas. They were at first impressed with the tendency to exophthalmos in patients suffering from pancreatitis. They made a study of 5 cases—3 of acute hemorrhagic pancreatitis, 1 of purulent pancreatitis with necrosis, and 1 of chronic interstitial pancreatitis, and found that exophthalmos was present in 4 out of the 5 cases. The Graefe sign was present in 4, the Möbius and Stellwag's signs, tremor, and dermatographism were demonstrable in all 5. Relative lymphocytosis was present in 4. Phloridzin glycosuria appeared in all 5, and tenderness of the thyroid was demonstrable in all. They think that this evidence points unmistakably to disturbance of the internal secretions in disease of the pancreas.

The association of hyperthyroidism with tuberculosis has been studied by Brandenstein,² who found that only 21 of 100 cases (70 men and 30 women) of pronounced pulmonary tuberculosis were free from heart symptoms. All of these patients were nervous and excitable, and a large number of them exhibited symptoms which suggested hyperfunction of the thyroid. The author thinks that it is impossible to look upon this as a casual coincidence. He found enlargement of the thyroid in many cases of incipient tuberculosis. He emphasizes the similarity of the injurious action of the toxin in tuberculosis and of that in thyroid disease. He said it is just as plausible that tuberculosis may lead to disease of the thyroid as it is for syphilis, diphtheria, or any other infection to play this role, and he considers it possible that the hyperthyroidism having been started by the tuberculosis may persist even after the tubercular process has healed.

McCarrison³ has succeeded in isolating in pure culture a spore-bearing bacillus from the feces of a goiterous horse, and he found this bacillus constantly present in cultures from the feces from goiterous individuals. It is described as a rod, varying from 2 to 4 μ in size, Gram-negative, and stains well with carbol fuchsin, Fleischmann's and other stains. There is some variation in size and thickness, and some of them contain a lighter, unstained area usually situated at the centre. The organism is very apt to be motile in young cultures. It produces gas in glucose, levulose, manose, and galactose, but not in dextrose, mannite, lactose, or maltose. It does not curdle or acidify litmus milk, it does not liquefy gelatin, and there is a profuse brownish growth on a potato. It resists the bactericidal action of phenol in 5 per cent. solution for twenty-four hours in an incubator, and is likewise resistant to temperatures of 60° C. for one-half hour. 0.5 c.c.

¹ Deutsch. med. Woch., January 11, 1912.

² Berl. klin. Woch., September 23, 1912.

³ Annals of Tropical Medicine and Parasitology, December 30, 1912.

of living culture injected into guinea-pigs produced no immediate ill effects, and dogs, kids, and goats were equally resistant to larger quantities. A dog which had been given 9 Musgrave agar tubes of a forty-eight hour culture of this organism died on the ninth day. Of two agar tubes which were inoculated with the blood-stained fluid from the cut surface of the lymph nodes, one showed several colonies of the spore-bearing organism after twenty-four hours' incubation. The other tube remained sterile.

Types and Symptoms. The more one studies hyperthyroidism, according to Lambert,¹ the more one realizes that it is an expression of the algebraic sum of many morbid processes—some of these arising in the thyroid gland, others in the parathyroids, others in the pancreas and adrenals, or in the general metabolism of the liver itself; and there are evidences that the pituitary body and the ovarian secretion are not unimportant in the interrelationship among these many glands, and not without their influence in the varying expressions of the general metabolism of the body. Hyperthyroidism is not an entity, it is not the expression of a single influence. It is the manifestation of a lack of equilibrium in the relationship of many glands in the body, and this equilibrium may be upset by an increased function or a lack of function of any one of these related ductless glands. We must, therefore, realize that when we consider the atypical forms of Graves' disease, the thyroid gland may be the least at fault; and, furthermore, we must realize clinically that where tachycardia is present, we should think of some disturbance of internal secretion, and not put it down to mere nervousness, thus dodging the responsibility of a more accurate diagnosis. When nervous irritability and change of disposition occur, when formerly reasonable patients present a veritable chorea of intellectual functions, we should not attribute it to neurasthenia, but realize that they are suffering from internal poisoning, which we have been accustomed to consider as part of the symptoms of Graves' disease, and which we would readily recognize if the full picture were present, with exophthalmus, goitre, and the tachycardia combined. As long as the goitre or the exophthalmos is present, or the tremor with the tachycardia, there is no question that the patient will be quickly placed in the proper clinical group; but it is in those cases in which the symptoms which we formerly considered to be cardinal are absent, or where they are present only in a slight degree, that we usually fail to recognize the chief disturbance as one of upset equilibrium among the ductless glands.

Speaking of an intermittent type of exophthalmic goitre, Curschmann² cites a number of cases from his practice which developed the complete picture of hyperthyroidism at intervals, in addition to other

¹ New York Journal of Medicine, September, 1912.

² Zeitsch. f. klin. Med., vol. lxxvi, Nos. 3 and 4.

phenomena, involving the sympathetic and cerebrospinal systems. The first case described was a tabetic, who developed pronounced exophthalmic goitre during his gastric crises. In the early history of the case the symptoms of hyperthyroidism disappeared as the gastric crises subsided, but later there was more or less persistence of slight exophthalmos with goitre, these characters being exaggerated during the critical attacks.

Two other cases cited were asthmatics who developed the Basedow symptoms during their attacks. In addition to the cardinal symptoms—exophthalmos, tachycardia, tremor, and sweating—there were evident various vasomotor phenomena, redness of the face, injection of the conjunctivæ, cyanosis of the fingers, irritability, agitation, and psychic disturbances, but there was no enlargement of the gland. One of these cases showed the presence of symmetrical lipomas in the neck, and, during his asthmatic attacks with hyperthyroid symptoms, these tumors would swell, and again subside as the attack disappeared. It is evident here that whatever influence brought on the asthma and hyperthyroidism, acted on the vasomotors of the lipomas as well. Curschmann concludes that some irritation of the nerves which regulate the thyroid secretion seems to be the essential primary cause. The influence of epinephrin is displayed in these cases where Curschmann found that 3 to 10 drops of a 1 to 1000 solution, given by the mouth, were much more effectual than either morphine or sodium nitrite.

In this connection, Horsley and Rosebro¹ report a case in which the hyperthyroid symptoms of extreme nervousness, with tremor and tachycardia, recurred regularly at the menstrual period, and lasted for four or five days. The patient, following a pelvic operation, developed these symptoms, and at this time they persisted for two weeks. A partial thyroidectomy was followed by marked and continuous improvement.

When exophthalmic goitre develops in consequence of a trauma, it is generally assumed that the individuals were previously not entirely sound; or, as Oswald² has contended, there is some predisposing condition of the central or sympathetic symptoms. Dyrenfurth³ reports three cases of exophthalmic goitre which sustain this assumption. Of three cases developing after an accident, two of them showed the stigmata of hysteria, and the third, a man, previously had enjoyed perfect health. Two or three weeks after he had recovered from the effects of an automobile accident nervous symptoms developed, and, six months later, he showed the signs and symptoms of exophthalmic goitre. Dyrenfurth questions which was the predominant factor in this case, the physical or the psychic shock. He states that our expe-

¹ New York Medical Journal, February 10, 1912.

² Loc. cit.

³ Deutsch. med. Woch., November 21, 1912

rience with operation in these cases of trauma generally is not very encouraging. Operation seems to do little, if any, good in these cases, while it may be of value in others. He thinks that since trauma may excite hyperthyroidism, this fact may support the assumption that, as a cause the disfunctioning of other glands is to be considered as well as that of the thyroid. Disturbance or enervation of any gland is the hypothetical basis for defective functioning of that gland, and this hypothesis supports the conception of the importance of psychic trauma as a cause in these cases.

Schlesinger¹ describes the symptoms in acute exophthalmic goitre, and calls attention to the clinical picture these cases may sometimes present—at times simulating cancer, lymph node tuberculosis, or typhoid fever. The chief Basedow symptoms may not be present, the unusual signs predominating. In the author's experience, the extremely rapid loss of weight is most striking. Among his cases, one patient lost 44 pounds in one month, another lost 66 pounds in ten weeks, and a more recent case showed a loss of two-thirds of the body weight in eleven weeks, or a drop from 189 to 61 pounds. Rapid loss of weight, therefore, should make one suspicious of the existence of this disease.

Another frequent finding is splenomegaly. The acute form of the disease is more frequently accompanied by fever than is the clinical form. In regard to the gland itself, it may be normal, or even smaller than usual, but the author holds that the soft, continuous vascular murmurs characteristic of Basedow's are revealed on auscultation. Tachycardia is constant; there is a characteristic Basedow pulse, but the arteries are small and have thin walls. Stellwag's is a frequent and early sign. The blood shows the same changes as occur in the chronic form of the disease. The appetite may be excessive, or there may be anorexia. There is irregular diarrhea. In three of his cases, emaciation with jaundice were the only symptoms at first of what later proved to be exophthalmic goitre. Glycosuria was frequent, and alimentary glycosuria was always demonstrable. The author lays weight on the importance of a correct diagnosis in these cases, because of the fact that they are so susceptible to injurious influences. A brief general anesthesia, a slight operation, or a mild infection, may lead to a fatal issue. He cites one case in which the patient died a few hours after the onset of a follicular tonsillitis.

Hypoplasia, in these cases, is apparently a constant finding post mortem. Hence, the author suggests that it is only in hypoplastic individuals that acute exophthalmic goitre develops, as a result of injury from excessive or perverted thyroid functioning. When there is no tendency to hypoplasia, only the chronic form asserts itself. The slighter resisting powers of the hypoplastic individual permits

¹ *Therapie der Gegenwart*, November, 1912.

the more stormy onset of the acute form of the disease. The author believes that operation in these acute cases is extremely dangerous, and advises a careful course of medical treatment.

A case of acute exophthalmic goitre is described by Riedel,¹ in a woman, aged thirty-five years. She first noted loss of weight and increasing weakness. Three months afterward, one morning she discovered a small lump in the suprasternal fossa. By noon it had attained the size of two fists, and during the afternoon she developed palpitation for the first time, and noted a distinct buzzing in the thyroid. Protrusion of the eyes and tremor of the hands came on in the course of a few hours. A week's rest in bed brought improvement, but after she had been up for two weeks, the symptoms became still more severe—the heart symptoms especially. The use of thyroid extract aggravated the case, but thyroidectomy was followed by prompt and progressive improvement. This is the second case in which Riedel has noted a subjective buzzing in the thyroid gland during acute enlargement with goitre symptoms.

Epinephrin is present in the blood of patients suffering from exophthalmic goitre, and Maurice² believes that this fact is responsible for the late symptoms in Basedow's disease—the exophthalmos, the high blood pressure, and the signs of visceral arteriosclerosis. The hypersecretion of the thyroid gland, combined with that of the adrenal gland, acts as a stimulant to the sympathetic system, and as a depressant to the central system. Operation in this late stage, the author considers dangerous because of the condition of the heart.

It is interesting to note that in 54 cases of Basedow's disease under treatment in Stintzing's clinic, Otto reports that the blood usually showed no increase in the number of leukocytes, or only a slight increase. There was usually an absolute, and seldom a relative lymphocytosis. In 8 cases the lymphocytes increased from 33 to 66 per cent., and there was a corresponding decrease in the number of neutrophilic polymorphonuclear leukocytes (58 to 28 per cent.). In 3 cases with frank Basedow's symptoms, lymphocyte values remained within normal limits (24 to 27 per cent.). In 5 cases there was a definite lymphocytosis, with a more or less decided decrease in their percentage after operation.

These latter findings are contrary to those of Klose, Lampe, and Liesegang,³ who state that in this disease lymphocytosis is constant, and give reasons why the lymphocytes always persist after operation for relief of this condition.

Kolb⁴ reports the case of a man, aged forty-five years, who had suffered from a rebellious diarrhea for fifteen years. Goitre had developed in his eighteenth year, and this fluctuated in size, but during

¹ Münch. med. Woch., July 9, 1912.

² Lyon Méd., October 20, 1912.

³ Loc. cit.

⁴ Münch. med. Woch., December 3, 1912.

the last six years it had grown steadily larger. The patient suffered occasionally from headache and palpitation. After a diagnosis was made, and a thyroidectomy performed, the diarrhea disappeared. Kolb suggests that diarrhea may give the clue to diagnosis in obscure cases, and says that all cases of diarrhea which prove rebellious to treatment, and which have no demonstrable clinical basis, should be carefully inquired into for the possible presence of an incipient exophthalmic goitre.

He refers to a case recently reported by Schmeden, which is very similar to his own case. The chronic intestinal disorder was not amenable to treatment, and there were no signs of tuberculosis or cancer, nor could any other organic cause be found. The patient showed signs of a mild exophthalmic goitre. An operation on the thyroid which was performed, promptly and permanently cured the condition.

Bittorf¹ describes a case of severe exophthalmic goitre accompanied by cardiorenal disease which showed that over 50 per cent. of the fat taken in with the food passed through the alimentary tract unutilized, indicating a functional disturbance of the pancreas.

Physical Diagnosis. To locate the upper pole of the lobe of the normal thyroid gland,² first locate the most prominent eminence of the thyroid cartilage (Adam's apple), follow down the median line from 1.5 to 2 cm., to the space between the thyroid and cricoid cartilages; follow the inferior border of the thyroid cartilage laterally, about 1 to 1.5 cm. till the median end of the oblique ridge is felt; follow the oblique ridge upward and backward to its posterior end. Press the finger into the groove just below the oblique ridge and parallel to it. The upper side of the finger will rest against the oblique ridge, the lower side of the finger will come into contact with the upper pole of the thyroid lobe. The landmark, then, is the oblique ridge on the wing of the thyroid cartilage.

While carrying out the above-described maneuver, slight extension of the neck, with or without rotation, is desirable. Woodbury usually prefers to have the neck partially rotated (away from the side which is being examined), as in that position the second step in examination follows rather more readily.

With the forefinger (right or left, depending on which side of the patient he stands) pressed firmly against the upper pole, the examiner should rotate the patient's chin (away from the side being examined) until it is as nearly over the opposite shoulder as is possible without undue extension on the sternomastoids; the neck should at the same time be extended, that is, the chin should be tilted up. The patient should be directed to let his head absolutely rest against the assistant's hand or whatever support is provided. If the sternomastoid is still too tense, the assistant should slightly flex the side of the patient's

¹ Deutsch. med. Woch., May 30, 1912.

² Woodbury, New York Medical Journal, October, 1912.

head on the chest, thus bringing the sternomastoid origin and insertion nearer together and so relaxing the muscle. Now having the head in the proper position, the examiner should place the tip of his free forefinger 1 to 1.5 cm. from the median line, just above the suprasternal notch, and should make rather firm pressure. He should then attempt, by pressing downward on the upper pole of the lobe, to bring the lower pole into contact with the lower examining finger. By slight readjustment of the lower finger, this is usually quite readily accomplished. When both poles are clearly felt, the patient should be instructed to swallow; the upper pole ascends beneath the upper examining finger and the lower pole moves out of contact with the lower finger, but is felt again as the lobe descends when the act of swallowing is completed. The assistant then measures the lobe with compasses under the direction of the examiner. For measuring the width of the lobe, Woodbury tries to select a line which is continuous with the lower margin of the isthmus of the gland. This measurement is usually easily made. With the neck moderately extended and rotated about 45 degrees (away from the field of examination), the lobe is rolled under the forefinger and its width measured with the compasses.

Treatment. During the past year nothing new has been developed in the treatment of exophthalmic goitre, although this subject has been written upon extensively.¹ A series of five questions was sent out to the members of the Chicago Surgical Society, in order to elicit information based upon a personal knowledge of Graves' disease. The questions were as follows:

1. What has been your experience with exophthalmic goitre?
 - (a) As to the extent of work done in this line.
 - (b) Methods of treatment employed.
 - (c) Percentage of cures observed as regards thymotoxicosis and secondary jaundice.
2. What particular operations have you employed?
 - (a) What methods do you suggest in various types and conditions now?
 - (b) What preliminary treatment, if any, do you use?
3. What have been your results as to mortality?
 - (a) Immediate.
 - (b) Remote.
4. What constitutes, in your judgment, a cure in exophthalmic goitre?
5. In what classes of cases of thyroid enlargement do you advise operation?
 - (a) In what type of hyperthyroidism would you advise operation, and in what type would you advise no operation, or conservatism?

¹ Wm. Fuller, *Surgery, Gynecology, and Obstetrics*, November, 1912.

Six hundred cases were reported on by members of the Society, more than 80 per cent. of which were subjected to medical treatment before surgical measures were instituted. A few of the members were enthusiastic as to the efficiency of appropriate and properly conducted medical treatment. Two reported benefits obtained by medical treatment in the severest type of Graves' disease which the authors had ever met, the cures being apparently complete and permanent. Of the therapeutic aids, short of surgery, complete rest enforced for long intervals of time, along with carefully selected diet, proper hygienic surroundings, the administration of arsenic in some form, such as sodium cacodylate, seemed to be favored measures. A short summary of the gist of the several reports shows that the thyroid gland in its various degrees of perverted function may be managed successfully by the following measures:

1. Rest, hygiene, and suitable medication persistently employed for a reasonable length of time.
2. Limiting the blood supply to the gland by ligation of one or more of its arteries.
3. Ligation of one or more of the thyroid arteries with removal of a greater or less portion of the thyroid gland.
4. A combination of two or more, or all, of these therapeutic aids.

In the course of the last year, 54 cases of Basedow's disease were observed in Stintzing's clinic at Jena. Otto¹ says 10 of these were severe cases, 30 moderately severe, and 14 were of the milder type. Seventy per cent. were women and 30 per cent. men. These cases were treated medically, according to the newer procedures, for at least six weeks. If at the end of this time the patients did not show improvement, they were transferred for surgical treatment. Eight of these cases, or 15 per cent., were able to resume their work after treatment for an average period of two months. Of these 8 cases, 7 were mild and 1 moderately severe. In all, however, there was a typical Basedow complex, the cardinal symptoms all being frankly present. Twenty-one cases, or 39 per cent., were improved—2 of these being mild forms, 15 moderately severe, and 4 severe. Nineteen cases, or one-third of the whole number, resisted all medical treatment. Among these were 3 mild cases, 12 moderately severe cases, and 4 of the severe type. In general this material showed that not only cases of lighter grade, but also of severer types, were amenable to medical treatment. In the cases in which antithyroidin (Möbius) was used, no good results were observed. This was true also of the *x*-rays, where used. In a large number of those cases in which medical treatment had failed, the symptoms disappeared after operation.

Cohen² states that the great difficulty acknowledged by most of

¹ Med. Klin., June 16, 1912.

² New York State Journal of Medicine, July, 1912.

those who have had large experience in the medical management of Graves' syndrome, is the liability to overestimate the value of some therapeutic measures during the use of which spontaneous recovery may have taken place, for such recovery will take place in a very large number of cases without medication or any other interference whatever, if only the patient be kept at rest, with regulation of the diet, and under proper hygienic surroundings for a sufficient length of time. Indeed, spontaneous recovery may occur without prolonged rest, which is, however, less common.

Operation is not to be opposed, however, under all circumstances. Cohen advises operation, (1) when the disorder has persisted for a long time and is advancing despite skilful medicinal and hygienic management, including prolonged rest; (2) when the disorder is progressive, or far advanced and is disabling, or threatens to become so, even though no sufficient attempt has been made at medicinal and hygienic management, including rest; (3) when the patient's means or social status is such that rest is impracticable, and the disorder, though slight, is partially disabling and has persisted for a year or so under treatment, with no sign of yielding.

In summing up, he emphasizes the importance of early diagnosis in cases which are likely to be recognized as neurasthenia, hysteria, nervousness, anemia, neurosis, nervous depression, and the like. Rest he considers the mainstay in the treatment. There is no specific for the disease, according to Cohen. Good hygiene, regulation of the diet, active elimination, and educational exercises of the vasomotor system by hot and cold applications, are recommended.

SURGICAL TREATMENT. In speaking of the length to which the surgeon is willing to go in the relief of this disease, Musser says: "Let us see whether the facts justify the position of the surgeon. He is to be credited justly with the development of a splendid technique and with the reduction of operative mortality to a very small figure, but as to the ultimate result there remains some doubt." One should know the course and death rate of exophthalmic goitre and of a variety of complicating conditions. These are lacking. The fact, however, remains that the problem is not the reduction of the death rate, but the prevention of invalidism, for such statistics as are available give the impression that death from exophthalmic goitre is not of frequent occurrence. The rate in medical practice is little, if any higher than the surgical death rate of 3 per cent. (This, of course, excludes death from mechanical causes, which never should be allowed to occur.) After having observed many cases of exophthalmic goitre under various circumstances, the question to Musser's mind is whether or not *any* violence to the system may not bring about temporary or even permanent relief of the symptoms. Thus, in one instance, the poor sufferer who had twice been operated upon by Kocher, lost his eye by an

explosion of fireworks. The eye had to be enucleated, and in spite of this terrible experience, the favorable progress of the thyroid condition was unaffected. In another instance, a woman, aged sixty years, showed severe symptoms of hypersecretion for five years. For two years she was in bed nearly all of the time because of weakness and a bad heart. While bed-ridden appendicitis with abscess occurred, and the surgeons declined to operate. Rupture into the bowel took place and she was ill for four weeks. Following this illness, such improvement in her hypersecretory phenomena occurred that she was able to walk about and for two years she enjoyed as much relief as we often see after a thyroid operation, and, as compared with her condition during the preceding two years, she was practically well. At the end of two years a bronchial pneumonia developed, thyroid symptoms recurred, and recourse was had to serum, but to no avail. The question, therefore, arises, Are operations on the thyroid beneficial because of the operation *per se*? (White.) The object of these remarks is to reinforce the principle admitted by surgeons that medical treatment, having for its object the restoration of the functions of other portions of the body, is more frequently available than surgical treatment; in short, goitre is not a surgical disease.

The conclusions arrived at by Musser¹ are:

1. Exophthalmic goitre should not be treated surgically until proper general treatment has been employed for a long period.
2. Surgical intervention should not be advised in cases of goitre associated with functional or organic disturbances of other secretory organs until the associated disorders are removed or relieved.
3. If relapse occurs in spite of general treatment, or in spite of treatment directed against the disorders of other organs, a goitre should then be treated surgically.
4. Medical treatment should be continued for from six to twenty-four months; favorable results should not be promised unless the patient is under the absolute control of a physician so that treatment by rest, bathing, physical therapy, etc., may be carried out with precision and continuity.
5. Surgical intervention requires the same rigid and prolonged after treatment to give permanent results.

Finally, Musser's conviction is that the surgeon does too much and the internist too little in the treatment of goitre.

A number of German clinicians,² in answering question blanks which had been sent them regarding their experiences with *Röntgen therapy in goitre*, advised against its use in simple goitre, but are favorable, as a rule, to this mode of treatment in exophthalmic goitre. There is a decrease in the size of the gland and the cardinal symptoms of exoph-

¹ American Journal of the Medical Sciences, June, 1912.

² Berger and Schwab, Deutsch. med. Woch., June, 6 1912.

thalmos and tachycardia along with the other symptoms of the disease show improvement. The patients, as a rule, gain in weight and general health. The general trend of opinion among these clinicians is that Röntgen therapy is fully equal to any other therapeutic measure.

Since 1908, Stoney¹ has treated 48 cases of exophthalmic goitre with the *x*-rays. Seven of these cases gave up treatment too soon to test the value of the procedure; the remaining 41 cases were of all kinds, from the acute and severe to the more chronic forms. Some were early cases; some had lasted for years under general medical treatment. The author gives a small dose at each sitting, about seven to ten minutes, according to the tube. The anode is placed 6 inches from the skin, which is protected by four layers of blanket. One-half to one milliamperè of current is led through the secondary. In acute cases, an exposure is given twice a week, as a rule, for a month, with an intervention of a fortnight, and then resumption of treatment. One exposure a week proved sufficient in chronic cases. The treatment is not hurried. When severe, cases require from six to eight months' treatment including the intervals when no exposures are made. Of the 41 cases referred to above, 14 are completely cured, in good health, and living their ordinary lives. Some of these cures have been of over two years' duration and most of the patients have been working hard. Twenty-two cases were greatly benefited, improved so much as to be able to live ordinary lives, doing their daily work, though still showing slight symptoms. Four of these cases are still under treatment and continue to improve. Four were unsatisfactory and showed only slight improvement, one being an imbecile, one in the menopause, one unable to go the long distance for treatment, and the other could not be taken as an in-patient and passed from the author's charge. Only one case has done poorly. In this, the condition was very acute, and showed but little improvement owing to worry, poor lodging, and insufficient food. From 136, her pulse rate came down only to 112 under treatment; she left the author's care, was operated upon subsequently and died within twelve hours after operation. Of these 41 cases, 36 have been enabled to resume their ordinary lives, *i. e.*, 87.8 per cent. Four were somewhat improved, and only one has not done well. As adjuvants to the *x*-rays, rest, quiet, and good feeding produce a quicker response. It is a good rule to lie down fifteen hours of the twenty-four. Some of these cases had had rest and good feeding for months and years, and yet did not make any real stride toward health until *x*-ray treatment was added, when improvement immediately began. Other cases were compelled to continue at their work throughout the time of treatment, and yet recovered. Under the influence of the *x*-rays, the pulse rate comes down, the heart resumes tone, and the goitre in many cases disappears. Exophthalmos usually rights

¹ British Medical Journal, August 31, 1912.

itself, but often not for months after all other symptoms have disappeared. The tremor and perspiration are slow to yield to the treatment. The author feels convinced that the *x-ray* is *the* treatment of the future.

Beebe's¹ work, or rather that of Beebe and Rodgers, has been reviewed before in these pages. In regard to the serum treatment, Beebe gives a classification of cases, showing the methods of procedure and the results obtained. He divides the cases into three classes:

1. The early cases of two weeks' to six months' standing with either mild or severe and acute symptoms; having all of the cardinal symptoms, or one or two of them lacking, but always showing an enlarged gland with some cardiac disturbance. In this class of cases, the best results are obtained. Those with mild symptoms are given a short course of treatment, consisting of eight to ten injections over a period of two weeks; those with severe acute symptoms require more active treatment, covering a period of four to six months. In this class, 80 per cent. show great improvement or complete cure.

2. Cases of considerably longer duration with a more or less marked course, exacerbations, and varying degrees of severity. These may be considered fairly typical examples of the disease of from four to eight years' standing. The final results in this class are not so favorable. Exophthalmos and goitre may persist, and the heart does not recover its tone so quickly, but there is an amelioration of the other symptoms. These cases require a long period of treatment and there must be enforced rest. In this class, 50 per cent. are either cured or show improvement to the extent that they may follow their ordinary activities.

3. Atypical cases. Those consisting of a curious mixture of Graves' disease and myxedema or cases of long standing which rarely show the typical condition found during the early development of the affliction. These are the most difficult cases to treat and constitute the smallest field for the application of the serum treatment. In fact, here the serum may do harm, and it is necessary to institute a careful inquiry as to whether we are dealing with a hypo- or a hyperfunction. Statistics regarding the serum treatment in this group of cases are useless.

Simple or Endemic Goitre. From a comparative study of thyroids from the region of Berne and the glands from the goitre-free regions of Koenigsberg, Berlin, Kiel, and Copenhagen, Wegelin² is led to believe that the noxious influences tending to the production of goitre are exerted on the structure of the thyroid gland from birth. He found that the Berne thyroids, especially in children, are much heavier than those from North Germany. Their follicles, on the other hand, were

¹ New York State Journal of Medicine, September, 1912.

² Correspondenz-Blatt. f. Schweizer Aerzte Basel, April 1, 1912.

smaller throughout. The Berne glands differentiated themselves further through the more frequent appearance of very large nuclei, rich in chromatin and the frequency of epithelial desquamation. They contained absolutely and relatively a greater number of epithelial cells than the North German glands, and produced the picture of an epithelial hyperplasia. These characteristics of the Berne glands are, according to Wegelin, nothing else than the first appearance of the changes which the thyroid suffers through the goitre poison. The fact that adults who go into a goitre district usually do not develop goitre, when, however, their children are subject to it, along with the fact determined by other authors that glands from children in the region of Berne show hyperplasia, indicates that the principle attacking point of the goitre poison is the thyroid of the fetus or the child. The goitre toxin produces an epithelial hyperplasia of the thyroid which very apparently has a regenerative character and is concerned with a primary injury of the epithelium.

Lobenhoffer¹ discusses the distribution of goitre in Bavaria. As many as 26 per cent. of the inhabitants of some towns are afflicted with goitre. The presence of the disease is always associated with certain geological formations, which are the source of supply for drinking water. The water from shell limestone is more responsible for the disease than that from any other formation. Boiling the water destroys the noxious agent. The last research of the subject seems to indicate that the cause is a purely chemical substance which is contained in the water and which is destroyed by heating to 70° C.

Schittenhelm and Weichardt,² from the contributions of physicians, district physicians, and the medical division of the War Department, and upon certain investigations on the distribution and course of endemic goitre in Bavaria, recognize three districts in which it is most frequent, the Alps, the Donautal, and around Rotenburg. School children prove to be a good criterion by which to judge the incidence of goitre in a region. The number of those afflicted with goitre increases with the development of the child. Proof of the relationship of goitre distribution to geologic formation is not convincing, but water rather appears responsible for the distribution of the disease. The authors were able to demonstrate antibodies to the toxins in these waters through the use of serum obtained from rabbits injected intravenously with the toxic water for a month.

In the maternity at Berne, Rubsamen³ found among 718 women, 34.2 per cent. afflicted with goitre. At Dresden, during the same period, only 0.29 per cent. were found. Of congenital goitre, he found 9 cases. These children all had goitrous mothers.

¹ *Mitteilungen a. d. Grenz. d. Med. u. Chir.*, Jena, vol. xxiv, No. 3.

² *Münch. med. Woch.*, November 26, 1912.

³ *Archiv f. Gynäkologie*, vol. xeviii, No. 2.

Holland¹ reports hereditary goitre manifested in five consecutive generations. Mrs. Y., aged twenty-six years, gave birth to her fifth child, a female, weight 10.5 pounds, plump, well-nourished, and normal in all respects except for a large tumor on each side of the neck in the anterior half, and difficult and noisy respiration. Each tumor was as large as the lateral half of a hen's egg, and there was no apparent connection between the two. The difficult respiration rapidly improved and disappeared in five days, but the tumors remained unchanged. Investigation revealed the fact that each of the previous children had had exactly the same condition at birth. In two of them, a male, aged six years, and a female, aged four years, the tumor had disappeared in infancy, and in one, a female, aged seven years, the tumor remained, and has grown larger proportionately with the child. One child, a male, was born with a tumor much larger than any of the others, and the respiration was proportionately difficult. This child died ten days after birth. The father and mother of these children are both goitrous, the father's was congenital, the mother's appeared with her first conception. The father's mother had a congenital goitre, as did her mother and grandmother. In none of them were there any symptoms attributable to goitre. All were apparently of the simple variety, and in each case it was congenital. The father has a sister living who is goitrous, but none of her children shows any thyroid trouble. The mother also has a sister who is goitrous, and whose children show no signs of goitre.

McCarrison² has found that the infecting agent in endemic goitre probably exists in the intestinal tract, and in this situation an amebic infection is demonstrable in the vast majority of cases. While endeavoring to collect amebæ from the feces of goitrous cases, he was impressed with the constant character of the bacterial growths obtained on Musgrove's medium. He made a vaccine from these growths and employed it in selected cases, administering doses of from 150 to 350 mgs. at intervals of a week to ten days. He has treated 33 selected cases of simple goitre by this means. The employment of the vaccine is accompanied by a rise of temperature a few hours after the injection. This is not severe if the initial dose does not exceed 150 mgs. After the gland begins to show signs of change, becoming softer and the skin over it becoming more lax, it is not necessary to increase the dosage at the subsequent injections. He found that, of the four different vaccines used, a composition vaccine gave the best results. McCarrison is of the opinion that the volume of the vaccine injected is of importance. The smaller the volume, the less the local reaction. Hence, he believes it is better to give, for example, 150 mgs. of bacteria in 5 minims of salt solution than in 1 c.c. of salt solution. The

¹ Journal of the Indiana State Medical Association, June 15, 1912.

² Lancet, February 10, 1912.

number of inoculations necessary to obtain a cure varies and, as a rule, in proportion to the age of the goitre. Generally from 4 to 7 inoculations or injections are sufficient. The value of this treatment is confined to cases of recent parenchymatous goitre. It is without effect in goitres of long standing where these tumors are largely made up of adenomas or cysts.

Hypothyroidism. The subject of hypothyroidism has received scant attention in the literature of the past year, excepting where this condition is mentioned in association with hyperthyroidism.

Myxedema and Cretinism. Theodore Kocher¹ finds that the changes in the blood picture in myxedema and cretinoid conditions are very similar to those which he discovered as being characteristic of Basedow's disease. The percentage of neutrophilic leukocytes is lowered, and there is a relative, or an absolute, lymphocytosis. In only 26 out of 155 cases did the neutrophilic element show no reduction, and these cases were complicated. The author found the lymphocytosis more constant in occurrence than the neutrophilic leukopenia, only 9 cases of the series not showing an increase in lymphocytes. These 9 cases he also explains as exceptional or complicated. The grade of the absolute leukopenia is, as a rule, greater than in Basedow's. The range, in most cases, lies between 3000 and 6000, as against 7000 in the normal man. As a rule, it is about 4000 or 5000. In a rapidly progressive case, the number was about 2000, and, in one child with mongolism, the number fell to 1383. The lymphocytes ran from 30 to 40 per cent., instead of the normal 25 per cent. Only very exceptionally did it go over 50 per cent. The eosinophilia remained within normal limits, from 2 to 4 or 5 per cent. The mast cells were present in proportion of 0.2 to 0.4 per cent.

In addition to these morphological changes, Kocher found that the coagulation period was shortened in these hypothyroid states, which is contrary to the findings in Basedow's disease, where the coagulation period is lengthened.

According to Osborne,² many of the conditions which are due to a hyposecretion of the thyroid gland are not recognized, the sufferers drifting from physician to physician and being benefited only when the true diagnosis has been made and proper treatment instituted. According to him, many of these patients are psychopathic, and may improve under mental treatment. The thyroid gland is peculiarly susceptible to mental stimulation or depression, and anything which quiets mental excitation will diminish a hyperthyroid secretion, and anything that removes mental depression will increase a subnormal secretion of the thyroid. A list of the conditions which the author thinks attributable to hypothyroidism includes cretinism, slow growth

¹ Archiv f. klin. Chir., vol. xcix, No. 1.

² Journal of the American Medical Association, November 2, 1912.

in children, some types of eczema, some forms of asthma, infantile obesity, chlorosis, amenorrhea, some digestive disturbances, some forms of epilepsy, some forms of gout, depressant hysteria, sometimes the vomiting of pregnancy, some forms of eclampsia, some forms of melancholia, adiposis dolorosa, lipomatosis, myxedema, senility, and perhaps Raynaud's disease. He cites a number of cases which have been improved or cured through the administration of thyroid. These cases include one case of slow development, two cases of eczema, three cases of asthma, one associated with intestinal indigestion and another with skin eruption; a case of intestinal indigestion with pigmentation, a case of epilepsy, one of rheumatic purpura, one of hemophilia, and one of amenorrhea. He believes that thyroid extract should be added to the list of poisons, and that the laity should be able to obtain it only through prescription, and advises that where it is administered, small doses should be used, as it is potent for harm, sometimes pushing a wavering gland to hypersecretion and Graves' disease.

French¹ calls attention to the fact that there are many grades of cases between the myxedematous or cretinoid on the one hand, and the healthy individual on the other, all of which properly come under the title of hypothyroidism. He divides these cases into six groups:

1. The infantile idiot type.
2. Children backward in walking or in talking.
3. Backward boys or girls, especially some suffering from nocturnal enuresis.
4. Stout sterile women of child-bearing age.
5. Women who tend to become very stout at or about the menopause.
6. Certain sufferers from functional nerve symptoms, notably exaggerated subjective sensations of acroparathesia and the like after the menopause, and most particularly that type of that little understood but very severe malady, *tic douloureux*. Some of the cases in all of these groups are distinctly benefited by the use of thyroid extract.

Olitsky² reports the case of a woman, aged twenty-four years, who was married five years and had given birth to one child. One year later she aborted at three months. In January, February, and March of 1912, she missed her period. Pelvic examination disclosed a normal uterus and adnexa. In March, while under observation, she appeared to have added about 25 pounds to her weight. She was large and clumsy, with puffy eyelids, heavy eyes, dry skin, and dull mentality. The thyroid was not palpable and the other organs were normal. Thyroid extract was ordered and by mistake she took 30 grains per day instead of 15 for three days without untoward result. At the end

¹ Clinical Journal, London, February 28, 1912.

² Medical Record, New York, September 21, 1912.

of a week there was a slight menstrual flow for a day. The week corresponding to her menstrual period she had a scanty flow. The thyroid dose was reduced to 5 grains per diem, and she has had several normal menstrual periods since and at the same time has lost about 10 pounds in weight.

Another case is reported by Novis¹ in a man, aged sixty years. The condition was of ten years' standing. In this case, there was an excessive irritability of the skin, especially at night. The urine contained large amounts of albumin and casts. Under treatment with thyreoidin the case cleared up, and the albumin and casts disappeared from the urine.

v. Aichbergen² discusses the distribution of cretinism in a district of Austria. He believes that heredity does not play an important role in the cause of the disease. According to the author, cretinism is a family disease, and is probably transmitted from one member to the other through close association or contact. He cites numerous examples in support of this theory, and calls attention to the fact that children may be born of a cretin mother, but that if they are immediately removed from her care and installed in a goitre-free family they will develop normally.

Thomas³ finds that in myxedema there is not only a congenital aplasia, but also a hypoplasia of the thyroid gland. In these cases, one does not find an organ uniformly decreased in size and situated in its usual place, but the thyroid tissue is dystopic usually enclosed in, tumors at the root of the tongue. The cases of total aplasia of the thyroid gland never live beyond the age of puberty and in those cases of congenital myxedema which have become older there is most probably present a congenital hypoplasia.

In the treatment of thyroid insufficiency Stern⁴ recommends the following combination: Sodium cacodylate, 0.005; epinephrin, 0.001; dried thyroid, 0.05.

He discusses the results of treatment by this combination in different types of hypothyroidism and insists that the treatment must be carried out for a long period of time.

¹ Lancet, October 26, 1912.

² Wien. klin. Woch., November 28, 1912.

³ Deutsch. med. Woch., March 7, 1912.

⁴ Berlin. klin. Woch., November 25, 1912.

OPHTHALMOLOGY

By EDWARD JACKSON, M.D.

Ophthalmoscopy. Every student who has learned to use the ophthalmoscope knows that the brilliant corneal reflex is one of the chief difficulties to be overcome before the eye-ground can be examined. Attempts have been made to escape the corneal reflex by throwing the light into the eye through one part of the pupil and looking in through another part. Every ophthalmoscopist learns to do this to some extent without thinking about it by shifting the position or inclination of his mirror. Wolff¹ does it by throwing light into the eye through one-half of the pupil and looking in through the other half. Gullstrand² has devised an instrument that illuminates the eye through a slit placed opposite the periphery of the pupil, leaving the whole central area for the observer to look through. This arrangement is better because the centre of the pupil is the only part that affords a perfectly distinct ophthalmoscopic image, while the peripheral portion of the pupil serves equally well for the illumination of the fundus. These instruments are of the large, fixed ophthalmoscope type, by which the fundus can be demonstrated to one not skilled in the use of the instrument.

For a hand ophthalmoscope, one of the most successful attempts in this direction is by the use of the U-shaped mirror, which Marple³ adopted for his electric light ophthalmoscope. In evidence of the superiority of such instrument, Marple reports that previous to its adoption he had found tubercles in the choroid in 5 per cent., or less, of the cases of tuberculous meningitis examined; about the same proportion as most of his colleagues. But, with his electric ophthalmoscope, and dilating the patient's pupils with weak atropine solution and having repeated examinations made by an expert ophthalmoscopist several times daily, among 13 cases of tuberculous meningitis admitted to the Babies' Hospital, everyone showed tubercles in the choroid.

The movement of the blood in the retinal vessels becomes visible when the current has nearly stopped, at death or during a syncope, the blood column showing a fine granular appearance due to the corpuscles. This appearance is seen when the blood is moving slowly.

¹ *Zeitschrift für Augenheilkunde*, xxviii, p. 307.

² *Klinische Monatsblätter für Augenheilkunde*, April, 1912, p. 484.

Ophthalmoscope, x, p. 559.

Kraupa¹ reports that he has detected a similar movement of the blood in certain choroidal vessels. The blood column presented the same granular appearance. The normal movement in some of the choroidal vessels is comparatively slow. Black² calls attention to the *behavior of the retinal vessels under pressure on the eyeball, as an indication of the general blood pressure*. The tip of the finger is placed on the junction of the lids near the external canthus, while the eye is being examined with the ophthalmoscope. As pressure is made upon the eyeball in a child, pulsation of the veins will be first observed, then the arteries diminish and the veins are almost emptied of blood. In old persons with rigid vessels very little effect is produced. In patients with dilated heart and very low blood pressure, the arteries are more affected than the veins. The test is one very quickly made by the ophthalmoscopist, and may give valuable indications as to the importance of measuring the blood pressure by other methods.

The Tonometer. The instrument devised by Schiötz for testing intra-ocular pressure has been slightly modified by Gradle.³ It is placed directly on the cornea, and gives a result which may be subject to individual variations due to the shape of the cornea or the method of its application, but which are far more exact than those gained by the method of estimating the intra-ocular tension by the finger tips. The results of many clinical studies of the tension of the eyeball with the instrument have now been reported. They are most important in connection with glaucoma, but are of practical interest in other directions also.

Studies of the normal eye have been made by Heilbrun⁴ and Lübs.⁵ They place the range of normal intra-ocular tension at about 12 to 27 mm. of mercury. It is the same for both normal eyes of the same individual, and is about the same for all ages. Pilocarpine and eserine reduce the pressure 3 to 8 mm. Subconjunctival salt solutions increase it about the same amount. After cataract extraction, it took four weeks for the pressure to come back to normal. Lübs found normal tension in highly myopic eyes; but Cecchetto⁶ found it reduced in myopia with sclerochorioiditis. It returned to normal with treatment of this complication. Diminished tension is not always found with simple detachment of the retina, nor increased tension with intra-ocular tumors. While Heilbrun thinks that in simple glaucoma, the intra-ocular pressure is always raised above the normal for that individual, it may not be above the general normal limit for others. Cocaine

¹ Centralblatt für praktische Augenheilkunde, xxv, p. 33.

² Journal of the American Medical Association, lvii, p. 362.

³ Ophthalmic Record, xxi, p. 468.

⁴ Graefe's Archiv für Ophthalmologie, lxxix, p. 552.

⁵ Klinische Monatsblätter für Augenheilkunde, September, 1912, p. 371.

⁶ La Clinica Oculistica, xii, p. 739.

lowers the tension from 1 to 4 mm. in the normal eye. Hence holocaine is commonly used as the local anesthetic which must be instilled before applying the instrument to the cornea; although, if the tension were taken soon after using cocaine, the result would not be vitiated to any important extent.

DISEASES OF THE CONJUNCTIVA

Conjunctival Applications. A convenient *drop-bottle* has been prepared by Ballantyne.¹ It has the general shape of a test-tube with the open end drawn to a beak. An opening about the middle of the bottle on the side opposite the beak is covered with a broad rubber band. Pressure on the band expels the contained fluid drop by drop. With the band slipped aside, the bottle is easily filled through the opening, and it can be readily sterilized by heat. The old-fashioned *eye-cup* has been improved by the addition of a rubber band at the rim, which makes it adaptable to differing forms of orbit. This idea was independently published by Coulomb,² and by John Green, Jr.³

Diplobacillus Conjunctivitis. As a contagious disease this is of more practical importance than the so-called acute contagious conjunctivitis caused by the Koch-Weeks bacillus. An epidemic occurring at Vashui, Roumania, is reported by Sava Goiu.⁴ Two boys, proved bacteriologically to be suffering from the disease, bathed in a public bath from which other boys and a company of soldiers became infected. It attacked 47 of the soldiers, 12 boys, and 23 other persons in the community, who were seen in consultation. The epidemic began in December, and continued into February.

The diplobacillus of Morax and Axenfeld has been sought for outside the conjunctiva, generally with negative results, although it has been reported present on the mucous membrane of the nose. Ishihara⁵ reports 27 cases in which the conjunctivitis accompanied *perlèche*. This is a condition characterized by painful fissures in both angles of the mouth. It spreads along the border of the lips, tending to involve the mucous membrane, which becomes white and thickened. It has been recognized as contagious, occurs chiefly among children, and runs its course in ten to twenty days. Ishihara says it is widely distributed in Japan. In his cases, he found the Morax-Axenfeld diplobacillus both in the lesions of the mouth, and in the conjunctiva. The clinical histories seem to show that it was contracted originally

¹ Ophthalmoscope, x, p. 570.

² L'Ophtalmologie Provinciale, ix, p. 129.

³ American Journal of Ophthalmology, xxix, p. 264.

⁴ Annales d'Oculistique, cxlvi, p. 98.

⁵ Klinische Monatsblätter für Augenheilkunde, October, 1912, p. 418.

in the mouth, and carried hence to the conjunctiva by the fingers. With the diplobacillus, in the mouth, he found streptococci and staphylococci. But these he also found about the angles of the mouth in all of 33 persons not affected with perlèche. But in no person free from the disease did he discover the diplobacillus.

Trachoma. The methods for the *Finsen light treatment* for trachoma and the results obtained with it are reported by Grönholm.¹ Only one square centimeter of conjunctiva is exposed to the light at one time, and this exposure is continued from five to forty minutes. But several such areas may be treated at one sitting, which thus lasts an hour or two. A severe inflammatory reaction follows. The lids and conjunctiva are greatly swollen, and the latter covered with gray false membrane. Usually within a month the cure is complete, and the shrinking and scarring are not greater than after other methods of treatment. One hundred and nine eyes were treated; 60 but once, 29 a second time, and the remainder from 3 to 6 times. Eighty-one per cent. are reported cured for the time, and 60 per cent. remained cured. The others relapsed during the year or more they had been under observation. Cases with extensive shrinking of the lids are most liable to recurrence. The method is not free from danger of corneal complications, which seem to be aggravated or sometimes produced by the treatment; and in 3 cases they caused serious impairment of vision. Eyes presenting pannus or corneal ulceration must be treated with great caution. Other plans of treatment may be combined with this. The most rapid improvement was seen when the exposure to light was made a few days after pressing out the contents of the follicles.

Parinaud's Conjunctivitis. THE DIFFICULTIES OF DISCRIMINATING BETWEEN PARINAUD'S CONJUNCTIVITIS AND TUBERCULOSIS OF THE CONJUNCTIVA were recognized by some of the early writers on this subject, and for several years cases have been reported as of this disease, in which a tubercular etiology was probable, or demonstrated by inoculation experiments. Histological examination has never shown the characteristic structure of tubercle. Krusius and Clausen² report two typical cases. Both patients gave positive Pirquet reactions, and general febrile reactions to tuberculin injections. But they gave no local reaction, either to the injections or the instillation of old tuberculin in the conjunctival sac. Guinea-pigs were inoculated with tissue from each of these cases. From one case the animal showed no tuberculous lesions, but it gave a general reaction to tuberculin, which had not been present before the inoculation. In the other case, the guinea-pig developed "a very weak tuberculosis." These authors hold that the facts indicate a second tuberculous infection of the conjunctiva, in a patient who has previously had tuberculosis.

¹ Graefe's Archiv für Ophthalmologie, lxxx, p. 1.

² Archives of Ophthalmology, xlii, p. 165.

Stern,¹ who is convinced of the correctness of this supposition regarding etiology, reports a case as one of ATTENUATED TUBERCULOSIS OF THE CONJUNCTIVA. In his case, the material was inoculated in the eye of the rabbit and from thence to the peritoneum of the guinea-pig, and proved to be tuberculous.

Tuberculosis of the Conjunctiva. This condition, as commonly recognized, is defined by Eyre² as "an infective granuloma of the conjunctiva due to the multiplication of the bacillus and to the action of the toxins." Clinically, its manifestations are protean. The giant cell furnishes a histological basis; but sometimes the surrounding hyperemic granulation tissue completely masks it. He finds it occurs in about 1 in 3000 patients. He recognizes five forms which have been observed in the following relative frequency: Ulceration, 46; miliary tubercle, 25; hypertrophic granulations, 80; lupus, 46; a pedunculated tumor, 9. In his own cases, he has found the human tubercle bacillus in 62 per cent., and the bovine in 17 per cent.

Eyre still favors resort to surgical measures, but not so generally as he did formerly. For miliary tubercle, or pedunculated tumor, he advocates excision, if it can be done without risk of scarring or disfigurement; and for ulceration and for hypertrophic granulations, scraping and cutting may be practised. But he strongly advocates the administration of Koch's tuberculin T. R., under which the local lesions may almost be said to melt away. His initial dose has been $\frac{1}{200000}$ mgr., and his maximum dose has never exceeded $\frac{1}{20000}$ mgr. The intervals between the doses have varied from one to three weeks.

DISEASES OF THE CORNEA AND SCLERA

Simple Ulcer. To bring out the exact extent of the ulcer, von Reuss,³ after cocainizing the eye and washing the conjunctival sac, instils a solution of *fluorescein* and follows it with a 1 per cent. solution of *methylene blue*. This gives a deep blue tinge to the ulcer proper, while the disturbed epithelium at its margin appears green from the fluorescein. The method distinguishes between a true ulceration of the cornea and a patch of disturbed epithelium, a point which staining with fluorescein alone does not always settle. The staining of corneal ulcers is not only useful for their detection, but should be practised in all cases before attempting to make applications to the ulcerated surface.

Bronner⁴ reports three cases of superficial *corneal ulcer accompanied by myosis* that could not be overcome by atropine. There was severe

¹ Centralblatt für praktische Augenheilkunde, xxxvi, p. 321.

² Lancet, May 18, 1912, p. 1319.

³ Ophthalmoscope, x, p. 352.

⁴ Transactions of Ophthalmological Society of United Kingdom, vol. xxxii, p. 97.

pain and photophobia, and relief was not afforded by the ordinary treatment. In these cases, following the example of Morax, he did iridectomy when other treatment for six weeks to three months had failed to give relief. In a day the patient was free from pain, the pupil responded promptly to atropine, and the ulcers healed rapidly. His explanation is a neuritis affecting the corneal nerve endings, and provoking a reflex spasm of the pupillary sphincter; which spasm may in turn prevent the ulcer from healing.

Herpetic ulcers of the cornea recurring at the menstrual periods are reported by Mosso.¹ They run the usual course for such ulcers. The affected portion of the cornea showed diminished sensibility.

Punctate Keratitis. The etiology of this condition is still uncertain, and probably it arises from a wide series of causes. Bosser² reports two cases of young women who suffered recurring attacks of punctate opacities near the centre of the cornea with menstruation. Verhoeff's³ studies lead him to conclude that such attacks are of neuropathic origin, and he supposes the lesion is located in the ciliary ganglion. Gradle⁴ has described, as subepithelial, infiltrated areas lying under Bowman's membrane which recur with itching, photophobia, and infiltration. These pass away and the infiltrated area remains for about six weeks. After that, the eye seems normal until the attack suddenly recurs. He finds the condition in women, usually after thirty years of age.

Westhoff⁵ has observed a punctate keratitis among laborers in the muddy rice fields of Java. There are a great many points of opacity, some of them situated as deeply as the middle layers of the cornea. They are attended with photophobia, which disappears in about a week, leaving the specks which remain much longer, but ultimately they clear up.

Chronic Diphtheria of the Cornea. A great danger of ocular diphtheria is the liability of the cornea rapidly to soften and slough, leading to destruction of the eye. Buchanan⁶ saw a man whose eye had been sore for several weeks. The cornea presented an ulcer involving the lower third, which was grayish yellow, slightly elevated, and marked by specks looking like blood-clots. Its general appearance suggested a diphtheritic patch; but the conjunctiva was not thickened or covered by false membrane. Smears, cultures, and inoculation of the guinea-pig all showed the presence of diphtheria bacilli, which were virulent. The patient was given 4000 units of diphtheria antitoxin serum, and improved rapidly, the ulcer healing and leaving a firm leukoma.

¹ *Annali di Ottalmologia*, xl, p. 34.

² *Klinische Monatsblätter für Augenheilkunde*, May, 1912, p. 599.

³ *Archives of Ophthalmology*, xl, p. 486.

⁴ *Ibid.*, p. 535.

⁵ *Centralblatt für praktische Augenheilkunde*, xxxvi, p. 289.

⁶ *Ophthalmoscope*, x, p. 554.

Parenchymatous Keratitis. The *value of salvarsan* in this condition is not so great as in some of the more acute secondary symptoms of syphilis. Still, it is generally agreed that it controls the hyperemia and photophobia of this disease, and, in some cases, it has seemed to cut it short, particularly when used quite early. It would hardly be expected to have much effect in the late stages of corneal opacity. Igersheimer¹ found that repeated injections had much more influence. He saw improvement in the eyes after the first injection in 5 per cent. of his cases; after the second, in 25 per cent.; and in 36 per cent. after the third.

Corneal Opacities. OPACITIES CLOSELY RESEMBLING ARCUS SENILIS are sometimes seen in quite young persons. Attias² points out the differences between those that are due to faults in development, *embryontoxon*, and those due to age, *gerontoxon*, or arcus senilis. The latter form a complete circle, or a large arc above and a similar one below, surrounded by a ring of clear cornea adjoining the limbus from which they are sharply differentiated, while toward the centre of the cornea they fade out gradually into clear cornea. On the other hand, *embryontoxon* usually shows an upper-inner, smaller; and a lower-outer, larger segment. Or they may be located in the nasal and temporal margins of the cornea. They are sharply limited toward the centre of the cornea, and are more likely to appear in one eye only, and are generally more superficial.

A case of PRIMARY FATTY DEGENERATION of the cornea resembling one previously described by Tertsch, is recorded by Takayasu.³ A girl, aged sixteen years, who suffered from trachoma, presented a yellowish-white opacity which involved the whole cornea except a ring 1 mm. wide at the periphery. The centre of the opacity was slightly less dense than other parts. The removed tissue showed fatty degeneration of both epithelium and true corneal tissue. Libby⁴ saw SYMMETRICAL CIRCULAR OPACITIES, 5 mm. in diameter, below and to the nasal side of the centre of each cornea. They had appeared without severe inflammatory symptoms one and one-half, and one year previously, and showed no change while under observation. The corneal microscope demonstrated the presence of cholesterin crystals.

PIGMENT SPOTS IN THE CORNEA may be quite inconspicuous as seen against the pupil or iris, and so escape notice. Examining the cornea with a corneal microscope prior to cataract operation, Hudson,⁵ in two years, found 13 cases in which, without history of previous inflammation, a brown mark approximately horizontal was to be found at the junction of the middle and lower thirds of the cornea, which

¹ Ophthalmoscope, x, p. 631.

² Graefe's Archiv f. Ophthalmologie, lxxxi, p. 505.

³ Ibid., lxxxii, p. 475.

⁴ Ophthalmic Record, xxi, p. 30.

⁵ Royal London Ophthalmological Hospital Reports, xviii, p. 198.

appeared otherwise normal. Somewhat the same kind of pigment markings were found in the corneas of 5 other patients. Augstein¹ finds that the pigment deposits often supposed to be congenital appear during the first year of life, and continue progressive. Many pigmentations follow injury or uveal inflammations; and pigment cells may migrate from the deeper structures toward the surface. STAINING OF THE CORNEA by blood pigment is supposed by Buchanan,² who reports 5 cases, to be due to an absorption of hemoglobin from blood corpuscles broken up in the anterior chamber. It is carried into the cornea through Fontana's space, and tends to accumulate near the centre, where the lymph currents are more sluggish.

An ingenious suggestion for the TREATMENT OF LEAD OPACITIES is made by Elliot.³ He saw a very disfiguring opacity that occupied two-fifths of the cornea. It was not materially altered by free scraping. He then flushed the conjunctival sac with a watery solution of hydrogen sulphide. This immediately turned the surface dark brown, so that the patch was no longer noticeable. The brown color continued as long as the patient was under observation, three weeks.

Blue Sclerotics. An anomaly of the sclera, thinning and discoloration, so that the white of the eye appears "pale blue," "China blue," "azure blue," or "leaden," occurs as an hereditary condition in certain families. Burrows⁴ reports a pedigree of four generations, 29 individuals, of whom 13 had blue sclerotics. The condition was always inherited from a parent who showed the same anomaly. Adair-Dighton⁵ reports a pedigree of four generations, 12 individuals, of whom 9 had blue sclerotics. Both sexes were affected. In both these families, the persons with blue sclerotics showed excessive *fragility of the bones*. In the first family, 9 of the 13 had suffered fractures, and 7 of them multiple fractures. In the other family, five of the nine had suffered from multiple fractures. Sometimes the cause was very slight—a child sitting down suddenly on the nursery floor and breaking a femur. Burrows accepts the explanation of Eddowes, that both conditions depend on a general deficiency in the white fibrous tissue.

Necrosis of the Sclera. Limited necrotic areas in the sclera occurred in a case reported by Kuhnt.⁶ The patient suffered from hydroa vacciniforme, which began when he was one and one-half years old. At seven years, his left eye was affected; at twelve years, his right. At eighteen years he exhibited yellowish discoloration of the sclera, and punched-out areas in which only a thin layer of scar tissue covered the uveal tract. In the right eye the cornea was leukomatous, and also presented deep pits in the upper portion.

¹ Klinische Monatsblätter f. Augenheilkunde, January, 1912, p. 1.

² Ophthalmoscope, x, p. 190.

³ Ibid., ix, p. 498.

⁴ British Medical Journal, July, 1911, p. 16.

⁵ Ophthalmoscope, x, p. 188.

⁶ Zeitschrift f. Augenheilkunde, xxvii, p. 146.

DISEASES OF THE UVEAL TRACT

Peculiar Movements of Iris. It is pointed out by Münch¹ that the pupillary sphincter consists of physiological segments, each supplied by its own nerve twig, 70 or 80 in number. When the pupil is moderately dilated under a weak light, the contraction of the sphincter is decidedly peristaltic, only appearing uniform to the inexact observer. Sattler,² Hirschberg,³ and Münch call attention to certain *worm-like movements of the sphincter*. A limited thickening is found near some part of the pupillary margin which gradually passes around the circumference. Hirschberg compares it to a worm creeping around the pupil, by alternately contracting and relaxing its longitudinal muscles. Sattler thinks it has escaped notice heretofore because it is only visible when the iris is magnified. He observed 11 cases. It occurred only in persons who had sluggish or immobile pupils. Atropine and pilocarpine caused such contractions to cease, but cocaine did not.

Iritis. PRIMARY IRITIS, Ormond⁴ says, may result from any septic process affecting the body, hence the long list of diseases with which it has been associated. All the common varieties of pyogenic organisms, or their toxins, have been found associated with uveal inflammations. Causes like syphilis, gonorrhea, and tubercle are undoubted. Rheumatism, pyorrhea alveolaris, dyspepsia, and the uric acid diathesis, are less certain. Traumatism does not cause inflammatory reaction, unless some infection takes place. Iritis is associated with subacute rheumatoid arthritis, but probably not with acute rheumatism, except as a coincidence. Gonorrheal iritis is well proved, and cases probably arise from this cause twenty or thirty years after infection. He believes every case of iritis is of septic or toxic origin.

In *treatment*, the three important points are to keep the pupil widely dilated, to search diligently for the cause, and to relieve pain. The patient should be kept in a warm atmosphere, stimulants and meat avoided, and the bowels kept open by calomel and salines. Locally, he recommends atropine sulphate, and cocaine hydrochloride of each 4 grains, and dionin 12 grains to the fluidounce of water.

Choroiditis. The choroid is preëminently the vascular coat of the eye, and this fact cannot be neglected in considering its pathology. Hepburn⁵ makes the vascular systems of this membrane the centre of his discussion of its disease. Except in cases of injury, all inflammations of the choroid are caused through the bloodvessels. These convey

¹ Klinische Monatsblätter f. Augenheilkunde, April, 1912, p. 443.

² Ibid., September, 1912, p. 349.

³ Centralblatt f. praktische Augenheilkunde, xxxvi, p. 1.

⁴ Ophthalmoscope, x, p. 305.

⁵ Transactions of Ophthalmological Society of United Kingdom, vol. xxxii, p. 361.

the microorganisms or their toxins. The distribution and extent of the lesion will depend largely on the vessels of the layer in which it occurs. An inflammatory focus usually begins as a localized yellowish-white patch, somewhat prominent, with indefinite edges, because of edema or coagulation necrosis. If the inflammation is not too severe, these lesions run their course and undergo retrogressive changes. The more violent inflammations pass on to panophthalmitis. A patch of choroidal disease may disturb the functions of the retina lying over it by interfering with its nutrition, or by actual invasion of the percipient layer.

Hepburn classifies choroidal inflammations as disseminated diffuse, deep, localized, superficial, and macular choroiditis. The patch resulting from superficial inflammation has a definite pigmented edge. The deeper vessels may be seen to cross it undisturbed, and the scotoma it produces has the size and position of the patch. In deep inflammations, the large choroidal vessels are likely to be destroyed, and the scotoma produced commonly extends from the point corresponding to the location of the patch out to the periphery of the field.

Hepburn recognizes as vascular diseases of the choroid, degeneration of the choriocapillaris causing pigmentary degeneration of the retina, choroidal hemorrhages, emboli, which may cause limited atrophy or coloboma, and slight changes of the vessel walls causing such degenerations as Tay's choroiditis. Three cases of central guttate (Tay's) choroiditis are reported by Shoemaker.¹ The patients all gave evidence of arteriosclerosis, and to this vascular change the choroidal lesions are ascribed. All improved under treatment for the vascular condition, so that vision became normal.

Sympathetic Ophthalmia. The battle of theories regarding this condition continues unabated. Just now it is waged around the *anaphylaxis hypothesis* that has been elaborated by Elschnig.² He and Salus found that the injection of uveal emulsion, or of the uveal pigment alone caused, in the animals experimented upon, a sensitization to such an antigen. This affected the entire body, but especially the uveal tract. Their results were tested by complement fixation. By this theory, the diseased uvea in the exciting eye is a menace to the fellow eye through the process of sensitization. Indeed, disease in one portion of the uveal tract tends to influence unfavorably other parts of the uveal tract in the same eye. The blood serum, through the vessels, becomes the channel for transmission of injurious influences. It is a recasting and elaboration of the cytotoxic theory of Brown Pusey.³ It indicates the possibility of such disease arising from non-perforating wounds, or even without trauma of the exciting eye. The

¹ American Journal of Ophthalmology, xxix, p. 65.

² Graefe's Archiv f. Ophthalmologie, lxxix, p. 428.

³ PROGRESSIVE MEDICINE, June, 1905, p. 327.

additional factor needed to set up inflammation in the sympathizing eye, Elschnig finds in many different causes of uveitis and particularly in intestinal auto-intoxication.

The blood count in sympathetic ophthalmia has been studied by Browning,¹ who, with his assistant, Price-Jones, confirms, in the main, results previously published by Gradle. The blood findings are so similar to those of protozoal infections, like trypanosomiasis and syphilis, that he was led to try injections of *salvarsan* in 17 cases of hopeless sympathetic ophthalmitis. In each of these, the blood count quickly became, or approached, normal, and the eye became quiet. Most of the cases showed a negative Wassermann reaction. This experience suggests salvarsan as worthy of trial, when, in spite of all recognized remedies, sympathetic inflammation appears to be going from bad to worse. Purtscher and Koller,² in an examination of 9 cases of sympathetic uveitis, and 16 cases of iridocyclitis of other origin, found the characteristics of the blood count pointed out by Gradle as so constantly present in sympathetic disease, that they suggest such a lymphocytosis as a valuable aid in the diagnosis of the former condition.

Metastatic Ophthalmia. This is one of the complications which may arise in connection with many acute diseases. A violent panophthalmitis arising in the third week of an attack of acute lobar pneumonia, is reported by Cosmettatos.³ The eye was enucleated; and cultures taken from the interior demonstrated the presence of the pneumococcus, which had set up a suppurative inflammation of the whole uveal tract. A case occurring with puerperal sepsis is reported by Alter.⁴ In this case, too, the intolerable pain called for enucleation. Specimens of pus taken from the interior of the eyeball showed it to be a mixed infection. From a study of the recorded experience, Alter finds that bilateral metastatic ophthalmia is followed by death in probably 90 per cent. of the cases. When one eye is affected it is usually lost, but the prognosis for life is much better. In rare cases, following the acute exanthemata, some vision may be preserved.

GLAUCOMA

Glaucoma with Senile Cataract. It has long been recognized that swelling of the lens, as it becomes opaque in senile cataract, may cause increased intra-ocular pressure; but the condition has generally been regarded as possible, rather than of serious practical importance.

¹ Ophthalmoscope, x, p. 629.

² Graefe's Archiv f. Ophthalmologie, lxxxiii, p. 381.

³ Archiv f. Augenheilkunde, lxxiii, p. 30.

⁴ Ophthalmology, viii, p. 488.

In his large clinic at Madras, India, Elliot¹ sees about 50 cases a year of glaucoma complicating cataract. As a rule, he finds the glaucoma arises when the patient has neglected to seek surgical interference long after the cataract was fit for extraction. He reported 52 such cases in which he did the operation of trephining. But only 7 of these subsequently returned for extraction of the cataract. Such cases are generally unfavorable for cataract extraction. Rosenfeld² arrives at a similar prognosis from a study of 25 cases of swollen, immature, senile cataract, causing glaucoma.

Glaucoma following cataract operations is found by Stoelting³ to arise in three ways: From incarceration of the capsule followed by inflammation; from invasion of the anterior chamber by epithelium through the corneal wound; and after discission. The danger of greatest practical importance is the incarceration of the capsule, which is favored by stroking back the iris with the spatula.

Treatment of Glaucoma. That *massage of the eyeball* exerts a favorable influence on some cases of glaucoma, has long been claimed by certain advocates; and it is generally admitted. P. Knapp⁴ has tried to determine, by systematic statistical study, how much that favorable influence amounts to. He used the method of Domec, pressing the thumb on the closed lid against the cornea, and repeating such pressures about one hundred times a minute. He tested the tension of the eyeball with the tonometer before and after the treatment, using 200, 500, or 1000 successive pressures every quarter of an hour for about one hour. He tried this on 73 eyes of 41 patients. The average reduction in ocular tension, after 1000 such pressures, was a little less than 9 mm. As a rule, the tension returned to its original condition within three-quarters of an hour. In acute glaucoma, there was no fall of tension. In slight glaucomatous attacks, and in simple glaucoma, there was almost always a reduction. The effect was still more pronounced and more durable in eyes that had been operated on for glaucoma; the massage increasing the filtering capacity of the scar. In a few cases massage actually increased the tension. When it is remembered that, in a case of pronounced glaucoma, the intra-ocular tension is usually from 25 to 100 mm. above the normal, the influence of massage is not great or prolonged enough to justify making it a leading part of the treatment.

The literature of the past year shows that the making of a subconjunctival hole in the sclera, or at the sclerocorneal junction, as by *trephining*, or the *Lagrange operation*, has found considerable favor among ophthalmologists. Probably more trephinings are now being

¹ Ophthalmoscope, x, p. 244.

² Zeitschrift f. Augenheilkunde, xxviii, p. 284.

³ Graefe's Archiv f. Ophthalmologie, lxxxi, p. 518.

⁴ Klinische Monatsblätter f. Augenheilkunde, June, 1912 p. 691.

done for glaucoma than iridectomies. The immediate results seem to be as good, and the operation less formidable. The excision of a piece of the limbal flap, as advised by Lagrange, is very readily added to most operations for iridectomy; and many operators feel that the trephine opening in the sclera is most likely to prove effective if a portion of the iris be drawn out and excised. A smooth cleanly executed trephining of the sclera, with or without removal of iris, heals with very little reaction; and, for a time, at least, keeps down the intra-ocular pressure. When the rush of articles proposing new modifications of technique has passed, we may hope for reports that will justify an estimate of the ultimate value of such operations. For the present they are not to be recommended over the classic glaucoma iridectomy for acute cases with good vision and healthy iris. For more chronic cases, or for simple glaucoma, in which the record of iridectomy is not so good, trephining in skilful hands is a fully justified and hopeful therapeutic experiment.

CRYSTALLINE LENS AND VITREOUS

Congenital Cataract. Important light has been thrown on the causation of congenital opacities of the lens, and incidentally upon the production of other *congenital defects* and anomalies, by the experiments of Pagenstecher.¹ He utilized the well-known power of naphthalin to cause lens opacities in animals and man, by feeding it to pregnant animals. In this way he was able to produce congenital cataract in rabbits and guinea-pigs, and in most of these animals other congenital abnormalities of the eye were present. *Naphthalin feeding* before the formation of the lens vesicle caused the lens to become invaded and fused with the surrounding mesoblast. Feeding after the closure of the lens vesicle gave variable results, as to the form and extent of the opacity. The opacities present at birth sometimes cleared up considerably afterward. Such clearing might occur before birth, the cataract remaining representing only the irreparable damage done to the lens. Similar changes were sometimes produced when the naphthalin was given at very different periods of fetal life. **LAMELLAR CATARACT** was caused by feeding during the middle third of pregnancy. In one case, total cataract followed very late feeding with naphthalin. None of the deformities thus produced were transmitted to later generations. A possibility of congenital cataract arising through poisoning of the mother should be borne in mind, and should point the direction for investigation of the etiology of this condition.

Holloway² reports upon a family consisting of two brothers and a sister, all of whom showed a peculiar form of lens opacity, a larger

¹ Archiv f. Vergleichende Ophthalmologie, 1912, ii, p. 424.

² Section on Ophthalmology, College of Physicians, Philadelphia, October 17, 1912.

opaque dot near the anterior pole and one near the posterior pole, and finer, less opaque, rounded, bluish dots extending out to the periphery of the lens. The eyes of the father and mother were free from any such defect; in the affected lenses the nucleus seemed to have escaped. This would suggest a possibility of poisoning in the latter part of the pregnancy.

In the *treatment of congenital lamellar cataract*, Kuhnt¹ insists that whatever operation is chosen should be done under a general anesthetic. The first important question to be decided is whether to attempt the improvement of vision by an iridectomy or by removal of the defective lens. By the former operation, the best vision to be hoped for is about one-third of normal. A peripheral pupil can never be expected to give better vision than this. Therefore, Kuhnt believes that optical iridectomy should be tried only in very exceptional cases.

The lens should be removed in such a way as to leave the pupil intact without distortion or adhesions; and to prevent any subsequent diminution of vision by a thickening of the capsule, which is more certain to occur the younger the patient. He first tests the pupil by dilating it with a mydriatic, and if it does not dilate well an iridectomy must be done preliminary to operation on the lens. The first interference with the lens should be a very small needling to test its behavior. After it has become largely opaque, it may be removed by linear extraction, or a freer discission may be done. The needle should always be introduced through the vascular tissue of the limbus. The last operation must effectively clear the pupil of lens capsule.

Operations for Senile Cataract. It is often difficult to decide what to advise a patient in regard to operation for senile cataract. Experience with the extraction of unripe cataract shows that, other things being favorable, there is no reason why a patient should wait for maturity of the opacity, when the vision of both eyes has become so impaired as to interfere with all ordinary occupations. But a cataract may be fit for operation, and yet other diseases be present which will necessarily prevent useful vision after the cataract has been removed. The conscientious physician will strive to avoid an unnecessary disappointment to the patient. But sometimes the result justifies the taking of apparently unfavorable chances. Marbaix² tells of a patient who had been counselled by experienced oculists against operation, and falling into the hands of a young specialist who had the audacity to operate, recovered two-thirds of normal vision. He then tells of one of his own patients with eyes badly damaged by myopia, who had purulent dacryocystitis and loss of light projection. This patient had been repeatedly advised against operation, yet it was done successfully, and gave very useful vision.

¹ Zeitschrift f. Augenheilkunde, xxvi, p. 430.

² Societe Belge d'Ophtalmologie, No. 32, p. 50.

In normal healing after cataract extraction, the wound should close in from two to four days. If it does not do so by the fourth or fifth day, Gifford¹ follows the teaching of Horner, and leaves the operated eye free from dressings, under a protective shield, while keeping a dressing upon the unoperated eye to restrain the movements. With the eye thus left free, he has never seen failure of the wound to unite in from one to three days.

Vision after Intracapsular Cataract Extraction. It has always been claimed that the visual results of the Smith-Indian operation, of extraction of the lens in its capsule, were superior to those obtained by operation that left the capsule behind, but convincing statistical evidence to support this claim has been lacking. Now Major Smith² has selected 150 cases, normal in every respect apart from the cataract, and, of these, in 119 he succeeded in testing the vision obtained, at from ten to twenty-one days after the operation. Of these, as tested at the near-point, Jaeger I was read by 10, who were English speaking; 14 threaded an ordinary cambric needle with great ease; 84 threaded the needle; and 9 threaded the needle with great difficulty. Distant vision was tested by "bulls' eyes" for those who could not read Roman or Urdu characters. The statistics show that more than three-fourths had better than $\frac{6}{6}$ vision.

More valuable statistics on this subject have been published by Greene and Millette.³ Of 103 operations, the results were not recorded in 10. Vision was lost in 4 eyes by infection; 7 got only light perception; in 3, vision was $\frac{20}{200}$; 43 had vision of from $\frac{20}{100}$ to $\frac{20}{40}$; while 136 gained vision of $\frac{20}{30}$ or better. This is a very good showing. But it is obtained by excluding 16 cases in which the attempt was made to extract the lens in the capsule, but the capsule ruptured; and also 8 cases with corneal opacities, 2 of amblyopia, 2 of optic atrophy, and one of central chorioiditis. The statistics cannot, therefore, without amendment, be compared with the usual statistics of results from cataract extraction.

Dust-like Opacities of the Vitreous. These have been commonly regarded as particularly significant of syphilis. Straub⁴ and his pupil, O Siau Dhai, made a careful clinical study of 14 cases, of which only 1 was syphilitic. Most of the other patients gave negative Wassermann reactions; and 8 at least were tuberculous. In 4 of the cases, the opacities were all dust-like, no larger ones being present. One of these was syphilitic, the other 3 were tuberculous. Such dust-like opacities were found to consist of collections of leukocytes. Single leukocytes may produce a slight haziness of the vitreous, but are too

¹ Ophthalmic Record, xxi, p. 9.

² Archives of Ophthalmology, xli, p. 608.

³ Section on Ophthalmology, American Medical Association, 1912, p. 313.

⁴ Transactions of Ophthalmological Society of United Kingdom, xxxii, p. 60.

small to be seen as separate points with the ophthalmoscope. The distribution of these dust-like opacities is often in groups, or on a membrane. These membranes, he believes, are the walls of cavities that form in the diseased vitreous. The points may also be found on the limiting membrane of the vitreous. Straub points out that fifteen years ago, experimenting with tubercle bacilli introduced on a wool thread through the sclera and ciliary body, he found the appearances of leukocytes collected on membranes or heaped together in dots, very similar to those now observed clinically. He believes there is a true inflammation of the vitreous, shown by the migration of leukocytes into it, and quite distinct from vitreous changes produced by inflammations of the ciliary body.

Bloodvessels in the Vitreous. These are generally taken as an evidence of previous hemorrhage. But Dunn¹ observed a case for more than a year in which tufts of vessels, each connected with a retinal vein by a stalk or pedicle, invaded the vitreous and progressively increased; without evidence of any large or important hemorrhage. Vision in one eye continued to remain excellent, but the development of the vessels continued in spite of mercury and large doses of potassium iodide and salvarsan. Many of the terminal twigs of the vessels ended in knobs formed by the winding of a minute vessel upon itself.

RETINA, OPTIC NERVE, AND TRACTS

Angiomatosis of the Retina. This condition began to attract attention when, in 1904, a case was reported by Von Hippel under the heading, "A Very Rare Disease of the Retina." He had been watching his case for eleven years, and had not encountered any other like it. Nevertheless other cases had been reported, one of them by Fuchs, as long ago as 1882. Twenty-five cases are now on record, 5 having been published in the past year. The disease is characterized by the appearance in the retina of relatively large, rounded, red masses, into which run one or more arteries and accompanying veins which are enormously enlarged and more or less tortuous. From time to time, new lesions of the same general character appear. The retinal vessels in general become altered, and the retina thickened and detached. Vision grows progressively worse. The course of the disease is chronic. von Hippel waited sixteen years before the eye in which he first detected these changes had to be enucleated for absolute glaucoma. Some have run a more rapid course. Frank-Kamenetski² saw a case which ran its course to complete blindness in a few months. In one-third of the cases, both eyes have been affected. Three-fourths of

¹ Archives of Ophthalmology, xli, p. 209.

² Viestnik Ophthalmol., 1912, No. 3.

the patients were males. Two of the cases occurred in a brother and sister. The ages of the patients when first seen varied from ten to thirty-three years. No general cause has been found for these cases, and treatment has been quite ineffective.

Retinal Miliary Aneurysms. Diseases of the retinal vessels are of general interest and importance because it is possible to follow the histological changes that occur during life in a way that cannot be done in any other part of the body. Leber¹ describes a characteristic form of degeneration of the retina accompanied by miliary aneurysms. He finds that cases which present miliary aneurysms fall into two groups: One is dependent on senile changes in the vascular system without inflammation. These present no other changes in the retina save minute hemorrhages. In the other group, the aneurysms are associated with retinal exudates resembling retinitis circinata. They are found in the region of the exudate or close adjoining it, and probably the vascular lesion is the primary one. The aneurysms appear as rounded swellings at the ends of small arteries, or sometimes veins, like berries on a stalk. These may be surrounded by small hemorrhages. Leber reports 2 cases occurring in men aged twenty and twenty-five years. In one, there was extensive infiltration of the retina, and, in both, retinal detachment. One of the patients gave a mild tuberculin reaction, and there are other cases on record with evidence of tubercular infection.

Retinitis of Pregnancy. It has long been recognized that the prognosis of albuminuric retinitis occurring during pregnancy was totally different from that occurring with chronic nephritis, both as to recovery from the retinal lesions and as to life. Recent investigations indicate that the ocular lesions occurring during pregnancy depend on a *toxemia* which may not be associated with disease of the kidneys. Rochon Duvigneaud,² in his important monograph on the subject, considers the retinitis of pregnant women quite apart from albuminuric retinitis in general. He finds that it probably occurs about once in 3000 pregnancies. Of 119 cases, 51 occurred during the first pregnancy. The eye-symptoms appeared in 21 per cent. before the sixth month; during the sixth and seventh months in 38 per cent., and in the eighth and ninth months in 33 per cent., and after delivery in 8 per cent. of the cases. Of the latter, some cases probably showed merely an aggravation of symptoms that might have been discovered before by careful examination; but, in others, they seem actually to have arisen after delivery. The prognosis as to vision and as to life, is greatly influenced by the continuance of pregnancy. Among patients that went to term, 15 per cent. died. After spontaneous premature delivery, there were 11 per cent. of deaths. After induced labor, the mortality was only 4 per

¹ Graefe's Archiv f. Ophthalmologie, lxxxi, p. 1.

² Société française d'Ophtalmologie, 1912, p. 1.

cent. Probably in many of these cases an injury has been done to the system, which later may be fatal. Recurrent attacks are more dangerous. In 19 cases of this kind, 9 terminated in death, 5 in blindness, and 5 in partial or complete restoration of vision.

As to *treatment*, the retinal condition, with serious impairment of vision, should be recognized as an imperative indication for the immediate termination of pregnancy. This is the more urgent because when the pregnancy is allowed to continue, it terminates, in 4 cases out of 5, with the death of the fetus. If the fetus be viable, its chances of survival are distinctly better with immediate delivery than if the pregnancy be not interrupted. As to subsequent pregnancies, the danger is always serious, but if an interval of two years elapse, with complete recovery from the first attack, another pregnancy may not be disastrous. But the patient should be closely watched throughout.

Albuminuric Retinitis. Rochon Duvigneaud believes that albuminuric retinitis, not due to pregnancy, is not always dependent on vascular disease. He finds that, in some cases, the only evidences of disease are shown in the retina and kidneys, with later a possible cardiac hypertrophy. The retinitis may be the first evidence of any departure from health. In its production, he thinks, retention of nitrogenous waste is the important factor.

Ginsberg,¹ who studied the eyes microscopically in 15 cases of albuminuric retinitis, found, in most of them, evidences of primary disease in the choroidal arteries, especially the thickening of the intima, which was sometimes replaced by a new-formed tissue, or converted into a hyaline mass. He thinks this change in the vessels accords with the old theory of a toxic substance, arising probably in the kidneys; a theory that is not yet to be discarded. The pathological conditions always found in the retina were edema, serofibrinous exudates, and a deposit of a lipoid substance, which can also be found in other forms of retinitis, and in conditions affecting other parts of the eye.

Sun-blindness. The importance of injuries to the retina that result from looking directly at the sun have been illustrated by the effects of the eclipse visible throughout Europe last April. Since that time more than thirty papers reporting cases of such injury have appeared in the medical journals of continental Europe. Cords,² who reports 11 cases observed by himself, sent a circular letter to his colleagues in the Rhine provinces in Germany, and learned of 387 cases, of which 166 were severe. In the discussion of one of the papers upon the subject, over 60 cases were cited from the practice of those taking part. Birch-Hirschfeld³ saw 34 cases involving 50 eyes, and, in reply to his inquiries, 35 colleagues in Saxony reported 225 cases. On this basis, he estimates that 3500 cases occurred in Germany.

¹ Graefe's Archiv f. Ophthalmologie, lxxxii, p. 1.

² Zeitschrift f. Augenheilkunde, xxvii, p. 511.

³ Ibid., xxviii, pp. 324, 444.

The ophthalmoscopic changes are commonly slight, but, in some cases, unmistakable. The macula is darker than normal, with small specks of lighter color, grayish or yellowish. Hemorrhage may occur, and atrophy of the optic nerve has been observed subsequently. The first complaint is generally of a central scotoma, from one-half to three degrees in diameter, with the appearance of a "bluish," "gray," "yellow," "brown," or "dark" spot before the eye. Sometimes the vision may be impaired over a much larger part of the field. Generally there is subsequent improvement. Uthoff,¹ who reports 26 cases, saw improvement in 90 per cent.; but, in 1 case, the vision grew progressively worse.

Birch-Hirschfeld's investigations show that the essential lesion is an injury to the outer layers of the retina, and to the pigment epithelium, with hyperemia and exudation in the choroid. He thinks the principal factor in producing the lesion is the action of the rays of the visible spectrum, neither ultraviolet or ultrared rays being of much importance. In the way of treatment, little can be done for this condition except to protect the eyes from strong light, and strong contrasts of illumination. The important thing is the prophylaxis, which consists in looking at the sun only through sufficiently dark protective glasses.

Toxic Amblyopias. The dangers of POISONING FROM METHYL ALCOHOL are not yet fully appreciated, and probably they are increasing with the wider use of this substance in the improved form that is largely free from disagreeable odor. In the past year, cases of poisoning by wood alcohol have been reported in Russia and Japan; so that it occurs throughout the civilized world. A larger proportion of these cases are occurring through use of this substance in the arts. Tyson² reports 3 cases of amblyopia from inhalation of the alcohol. One of these, like most of the cases previously reported, occurred in a varnisher, who was using shellac dissolved in wood alcohol, in a closed space. For this purpose, denatured alcohol is cheaper, but dissolves the shellac more slowly. In this case there was, for a time, a large central scotoma. But later this cleared up, leaving vision of $\frac{2}{3}$ %, with narrowed fields, especially for colors, and difficulty in seeing by reduced illumination. The other 2 patients were young women who worked at polishing lead pencils, using wood alcohol for it. In these cases, there was a possibility of absorption from also using the alcohol to cleanse their hands. The patients suffered from dizziness, nausea, and frontal headache after working three or four hours; and upon going out into the fresh air would feel better. The symptoms became more frequent after some months of this kind of work, and grew worse when the ventilation was shut off. The patients were free from them on Sundays and holidays. In these cases, there were great contraction

¹ *Klinische Monatsblätter f. Augenheilkunde*, September, 1912, p. 364.

² *Archives of Ophthalmology*, xli, p. 459.

of the visual fields, enlarged blind spots, and scotomas. Tyson concludes that methyl alcohol is a subtle poisoning, and should be recognized by law; that it may be inhaled in sufficient quantities during hours of labor to produce amblyopia, blindness, or death; and that, on premises where it is used, abundant ventilation and notices of its toxicity should be obligatory, and failure to comply with these requirements should entail criminal liability.

QUININE AMBLYOPIA may also be readily overlooked. Welton¹ saw a case in which 55 grains had been taken with whisky. Upon awaking next day, the vision was hazy, but there were no other symptoms of quinine poisoning, and the character of the trouble was not recognized. Two years later the narrowed visual fields, contraction of the retinal vessels, and atrophic pallor of the optic nerves testified to the cause of the trouble. Central vision was $\frac{1}{30}$ and $\frac{1}{20}$; but the field of vision was so small as to unfit the patient for many occupations. Four cases of quinine amaurosis are reported by Kalebiakin and Kaz.² The amount of the drug taken varied from 2 teaspoonsful to a table-spoonful. Complete blindness developed within twelve hours, and lasted from ten hours to two days. In the end, central vision returned to normal in every case; but the fields remained greatly contracted, with narrowed vessels and optic atrophy.

Optic Neuritis. RETROBULBAR OPTIC NEURITIS. We are learning that this may arise from many causes. Diseases of the accessory sinuses of the nose were alluded to last year; and several reports of cases having this origin have appeared since. A case in which the optic nerve lesion was one manifestation of an infectious *multiple neuritis*, is reported by Cramer.³ The patient, when first seen, had suffered for a week with fever and gastric disturbances, and his vision was greatly reduced, with central scotoma. Subsequently, he lost all light-perception, and continued blind for eight days, with absence of reaction of the pupils to light. Then the perception of light and pupillary reaction returned, and he slowly regained useful vision. But, at the end of one and one-half years, central vision was only $\frac{1}{10}$ in the right, and $\frac{1}{10}$ in the left. Color perception and the fields were greatly impaired. After the development of the eye symptoms, the involvement of other nerve tracts pointed to the general character of the pathogenic process.

In a boy, aged eighteen years, seen by Allport,⁴ blurring of vision was the first symptom noticed, but six days later he had a chill and rise of temperature. When seen on the eighth day, vision was $\frac{20}{200}$ and there was a central scotoma, although the ocular fundus was

¹ Annals of Ophthalmology, xxi, p. 739.

² Ophthalmic Review, xxxi, p. 244.

³ Klinische Monatsblätter f. Augenheilkunde, January, 1913, p. 58.

⁴ Ophthalmic Record, xxi, p. 670.

normal. He also had catarrhal jaundice and his urine showed albumin, much indican, and bile pigment. Under active eliminative treatment, he improved rapidly in all respects, and, within four weeks of the beginning of the attack, had normal vision with good fields.

OPTIC NEURITIS FROM GENERAL DISEASES. This is a possible complication of any of the acute specific fevers. The paper of Dutoit¹ includes reports of cases in which the neuritis was due to measles, 2; influenza, 2; scarlet fever and typhoid fever, each 1. He classes these cases as *infectious optic neuritis*, and tabulates the differential diagnosis between such cases and toxic optic neuritis. The principal distinctive symptoms are absence of pathological changes in the cerebrospinal fluid (except in secondary meningitis); fever, with evidence of acute infectious disease; a moderate swelling and hyperemia of the nerve head; and some contraction of the visual field, usually without central scotoma. Wiegmann² saw a mild optic neuritis in a woman, aged forty years, who had been suffering for three months from *whooping cough*. Other probable causes could be excluded. She recovered perfect vision. Wiegmann thinks that, in this disease, the neuritis may arise from mechanical interference with the circulation of lymph and blood in the nerve, with repeated attacks of congestion. Bourland³ records 2 cases of optic neuritis due to *malaria*. In 1, there were numerous hemorrhages into the retina, and, in both, partial atrophy of the optic nerve followed, reducing vision to $\frac{1}{20}$, with contraction of the visual fields and loss of color perception.

Two cases of optic neuritis arising during *lactation* are reported by Villard.⁴ One patient had been nursing her child for sixteen months, the other for about seven weeks. In each case, but one eye was affected. The vision slowly declined. The optic nerve-head was found congested, slightly swollen, with tortuous, full veins, and, in one case, retinal hemorrhage. One patient neglected treatment, and was found years afterward to have an absolute central scotoma of 6 to 8 degrees. The second patient recovered vision of $\frac{9}{10}$.

Nasal Hydrorrhea with Optic Atrophy. In discussing the relations of nasal hydrorrhea to lesions of the brain and visual apparatus, Wood⁵ concludes that the discharge which flows so copiously from the nose is cerebrospinal fluid. If there be organic disease of the nose, it is merely a coincidence. The course of the optic atrophy depends on the character of the brain lesion, which is the first consideration with regard to treatment. He reports 2 cases that suffered from nasal hydrorrhea with notable impairment of the fields of vision and evidence

¹ Archiv f. Augenheilkunde, lxxi, p. 1.

² Klinische Monatsblätter f. Augenheilkunde, April, 1912, p. 460.

³ Annales d'Oculistique, cxlviii, p. 362.

⁴ Ibid., cxlvii, p. 321.

⁵ Section on Ophthalmology, American Medical Association, 1912, p. 194.

of intracranial involvement. In another case, the discharge seemed to be stopped by removal of polypi and turbinal hypertrophies.

Oxycephaly and Ocular Lesions. Cases of tower skull with impaired vision are reported by Van Schevensteen¹ and Weekers.² In 64 collected cases of this form of cranial deformity, 7 presented bilateral blindness; 25, bilateral amblyopia; 9, blindness of one eye with quantitative vision in the other; and 11 with impaired vision of one eye, and 12 with fair vision in the both. The ocular defect is usually developed by the age of seven years, and remains unaltered after that. Weekers' patient, a boy aged six years, showed optic atrophy with vision reduced to $\frac{1}{6}$, and narrowing of the fields. Van Schevensteen's patient was a boy, aged five years, whose vision was reduced to $\frac{1}{10}$ in the right eye, $\frac{8}{10}$ in the left, with evidences of postneuritic optic atrophy. In both these cases, the radiographic examination showed early closure of the sutures, with hyperostosis of the base; and, in Weekers' case, there was notable enlargement of the sella turcica.

Disease of the Hypophysis. The symptoms of pituitary disease fall under two headings: Those of abnormal nutrition, and genital disturbances, supposed to depend on altered secretions of the gland; and those that arise from mechanical pressure exerted on neighboring parts—the "neighborhood symptoms" of Cushing. Werner³ points out that the nutritional changes are complex and variable; the pressure symptoms simple and readily explained. It is this definiteness of the visual disturbances which belong among the pressure symptoms that gives them their especial importance. The general symptoms are commonly explained as due to hypopituitarism, which checks sexual development and bodily growth in the young, and causes amenorrhea and impotence in adults; and hyperpituitarism, which produces gigantism in the young and acromegaly in adults. Werner thinks that even the anomalous cases may be explained on this basis, but mentions, as possibly correct, the hypothesis of Erdheim, namely, that the symptoms commonly ascribed to diminished secretion are due to pressure upon a particular brain centre which governs the formation of fat and bodily growth.

Werner reports 5 cases of pituitary disease without acromegaly. In 1 there were no glandular symptoms. There were *bitemporal hemianopsia*, with hemianopic pupillary inaction, and bulbar paralysis. The post mortem showed a tumor the size of an egg, occupying the enlarged sella turcica; but at no time was there evidence of intracranial pressure. The second case was one of bitemporal hemianopsia in a woman, aged thirty-five years, whose menses had ceased twelve years before, when she began to grow fat. She suffered from somno-

¹ La Clinique d'Ophthalmologie, xviii, p. 177.

² Société Belge d'Ophtalmologie, No. 34, p. 20.

³ Transactions of Ophthalmological Society of United Kingdom, vol. xxxii, p. 267.

lence and subnormal temperature. Six weeks' treatment with potassium iodide caused improvement in vision. In a third case, there was bitemporal hemianopsia and, later, complete blindness of one eye, with optic atrophy; moderate adiposity and enlarged sella turcica. The retained half-field of vision continued normal for five years. The fourth case was a woman, aged forty years, who had never menstruated, and had begun to get stout twelve or thirteen years before. She had disturbances of vision five or six years, which included a bitemporal hemianopsia. She suffered from somnolence. His fifth patient was a woman, aged twenty years, who ceased to menstruate four years before, and began to get very stout. Vision had failed in the last three weeks. She had a bitemporal hemianopsia that was at first relative and later absolute. This patient died two years or more afterward with cerebral symptoms. In the sixth case, a man, aged thirty years, with sight defective at times for a year, had bitemporal hemianopsia, drowsiness, subnormal temperature, enlarged sella turcica, and some of the bodily changes of acromegaly.

These cases well illustrate those in which giantism and acromegaly do not call attention to the nature of the disorder. Obscure disturbances of health and nutrition may go on for years without their significance being recognized. Later come the visual disturbances which point directly to the region of the optic chiasm and hypophysis. Then the diagnosis may be completed in many cases by an *x*-ray examination, which shows enlargement of the sella turcica, and absorption of its bony boundaries. Cases of the kind exist in most communities unrecognized.

Although the temporal hemianopsia is positive evidence of the location of the disease, it is found only temporarily at a certain stage of the progress of the case, and may be quite absent. Levy¹ reports a case in which one eye was quite blind from optic atrophy, but the other had full vision. Investigation showed the lack of sexual development and deposits of fat. Hessberg² saw a boy in whom both eyes were blind with optic atrophy, and only from the history could he guess the probability of previous temporal hemianopsia. In both these cases, the *x*-ray showed great enlargement of the sella turcica. Blindness in one eye, or any pronounced defect of the temporal field of vision in either eye, should awaken suspicion.

THE TREATMENT OF PITUITARY DISEASES falls under three headings: Operation, glandular feeding, and radiotherapy. Although Cushing sees for *operation* an important future, he admits that, for most cases, it can only be palliative. The danger attending it, whether done through the nasal sinuses, or from the temple, is so serious that it can hardly be advised for a patient whose life is not immediately

¹ Transactions of Ophthalmological Society of United Kingdom, vol. xxxii, p. 108.

² Klinische Monatsblätter f. Augenheilkunde, July, 1912, p. 94.

threatened, and who still lives in comparative comfort. *Glandular feeding* has been useful in some cases, but, until the different classes of cases are better differentiated, cannot be resorted to with much confidence. Thyroid extract has been most used in the past, but a reliable pituitary extract has now been obtained by Cushing and a few others.

Radiotherapy is also still experimental, but has seemed very beneficial in a few cases. Cauvin¹ reports a case, under observation three and one-half years, as cured by the *x*-ray. Amenorrhea and visual disturbance had continued nine months, and she had been treated for anemia, before the bitemporal defect of the field of vision was detected, and led to the diagnosis of acromegaly and tumor of the hypophysis. Radiotherapy was practised in 17 series of five exposures, each extending over a period of two and one-half years. Vision was restored to normal in one eye; $\frac{9}{10}$ in the other, with improvement in the visual fields. There was relief of headache, vertigo, and digestive symptoms; but amenorrhea and the altered appearance of the face and extremities persisted unchanged, but without further increase.

Word-blindness. Although this is not a disease of the eye, and most of the reported cases of congenital word-blindness have shown perfect vision, such patients are almost invariably brought to the ophthalmologist on account of supposed inability to see letters. This will doubtless continue until teachers and parents understand the significance of inability to learn to read, or even to recognize the letters of the alphabet. Hinshelwood² points out that the chance of recovering this defect is inversely as the age of the patient, and he reports 3 cases of acquired word blindness which illustrate this. A man, aged fifty-eight years, previously a teacher of languages, by great effort learned again to recognize the letters of the alphabet, but could not learn to read words by sight, and after a year gave up the attempt. A woman, aged thirty-four years, ultimately relearned to read fairly well, but, after ten years, was compelled to spell out some words. A girl, aged fourteen years, previously a good reader, was able, after four months, to recognize all the letters, and two years later she could read as well as ever. The best training to overcome the defect will vary somewhat with the character of the case.

OCULAR MOVEMENTS AND REFRACTION

Aural Control of Ocular Position and Movements. That the semicircular canals of the internal ear have to do with the maintenance of the equilibrium has long been accepted as an established fact in

¹ Archives d'Ophthalmologie, xxxii, p. 657.

² British Medical Journal, October 19, 1912, p. 1033.

physiology. In a series of papers, which secured for him last year the Graefe prize, Bartels¹ has carried our knowledge forward and made it more definite. He experimented chiefly through the method of producing *nystagmus* by rapid rotation of the body, by direct electrical stimulation of the labyrinth, and by applying heat or cold to the internal ear. The thermic method gave indefinite results. Electrical stimulation was most definite. Testing its effect on the isolated muscles, he proved that there is a continuous tonic influence on the ocular muscles exerted from the labyrinth. Stimulation tends to turn the eyes in the direction of the side opposite to the labyrinth stimulated. This is effected by contraction of one externus and one internus, and also relaxation of the opposing internus and externus by inhibition of the tonic influence. Electric stimulus necessary to produce such movements causes effects so unpleasant that the experiment cannot be repeated on man. But the effects of rotation nystagmus, and the behavior of the eyes in pathological conditions, justify the application to man of results obtained by experiments on the rabbit. A better understanding of the facts of nystagmus will add to its value as a symptom of organic nervous disease.

Nystagmus. MINERS' NYSTAGMUS (*Coal Miners' Neurosis*). This is the form of nystagmus of greatest practical importance, and the discussion of it at the 1912 Oxford Ophthalmological Congress brought out important facts. The myopathic explanation which was urged by the late Simeon Snell assumed that nystagmus was due to working in a cramped position by a poor light. This theory has obtained wide acceptance in our text-books, but all who have large experience with the condition are now agreed that it does not satisfactorily explain the facts. Some, like Llewellyn² and Cridland,³ are inclined to emphasize the importance of the illumination. Nystagmus occurs in safety-lamp pits, in which the illumination is only one-fifth what it is in naked-lamp mines. Again, differences in the quality of light and the proportion of ultraviolet rays have been marked as possible explanations.

But the important thought was brought out by Butler,⁴ who proposes to call the condition *coal-miners' neurosis*. It is universally agreed that it occurs only among those who mine coal. It does not appear until after a long period of such work, the average being nineteen years. It was almost unknown before the safety-lamp was introduced, and the safety lamp gives an inferior illumination. But the safety lamp is only used where the air is contaminated with the gases, hydrocarbons, that are liable to explode. Prior to its introduction, such mines were but little worked. Butler believes that the *nystagmus* is a

¹ *Klinische Monatsblätter f. Augenheilkunde*, August, 1912, p. 187.

² *Proceedings of the Royal Society*, May, 1912.

³ *Ophthalmoscope*, x, p. 699.

⁴ *Ibid.*, x, p. 680.

symptom of chronic poisoning by hydrocarbons, and that the neurosis can be recognized even though nystagmus is absent. He cites 3 cases of this character. Probably hydrocarbon poisoning, with deficient illumination, best explains all the observed facts. Improved ventilation and better lighting ought to do away with a disease, which, in certain districts, has disabled a large percentage of workers for any useful occupation.

VOLUNTARY NYSTAGMUS. This must be quite a rare condition, and yet 4 cases have been reported in the past year. Waddy¹ reports the case of a young man who was exhibiting, in the Berlin clinics, his power of producing horizontal nystagmus of the left eye, while the right was rigidly fixed. There were about thirty oscillations a minute. Weekers'² patient was able to produce twenty to thirty movements of both eyes in ten seconds. Both these patients exhibited anomalous movements in the pupil. In Stirling's³ case, the movements were almost too rapid to count. With Elliot's⁴ patient, the binocular horizontal movement was large and too rapid to count. All the patients appeared to produce the nystagmus by a concentrated staring effort. In Weekers' patient, vision was diminished during the nystagmus and objects appeared deformed, and Elliot's patient spoke of a feeling of weariness and lateral distortion of objects during the movements. These patients were all men, and otherwise healthy.

Congenital Defects of the Ocular Movements. A careful search for cases of this character, Duane⁵ believes, will show them to be common. The peculiarities generally supposed to distinguish them cannot be relied on. The absence of *diplopia* is exceptional. The patient generally does not notice double vision, but it can be demonstrated by careful testing, and he adopts peculiar devices and positions of the head to escape the annoyance. *Secondary deviation* may be as marked as in the acquired form of ocular paralysis. Secondary contracture of the opposing muscle is not so common as in acquired palsies, but is not rare. The internal muscles of the eye are not often involved.

The deviation is usually stationary, but not always. The principal varieties are: Insufficiency of the superior rectus, the parietic eye fixing; or paralysis of that muscle, and fixation by the other eye. Insufficiency of the superior muscle on one side, and of the inferior on the other. Insufficiency of the inferior rectus is often very slight. There are also insufficiencies of the superior and inferior obliques; vertical squint without definable paresis; and insufficiency of the retraction movements. Duane has seen 127 cases in all, of which 13 showed drooping

¹ Ophthalmoscope, x, p. 316.

² Archives d'Ophthalmologie, xxxii, p. 86.

³ Ophthalmoscope, x, p. 71.

⁴ Ibid., x, p. 70.

⁵ Transactions of American Ophthalmological Society, xii, p. 981.

of the lid to avoid diplopia. The disturbances of vertical movement, retraction syndrome, and false ptosis, are the important types.

Lagleyze,¹ excluding cases with important lateral deviations, has met with 17 cases of congenital vertical strabismus. In 11, vision was normal in both eyes. Only 3 showed difference of visual acuity in the two eyes. With regard to *head-tilting*, he found that, in all cases of downward deviation, the head was inclined toward the shoulder next to the deviating eye. In 6 cases of upward deviation, it was inclined toward the opposite shoulder. But, in 2 cases of upward deviation of the left eye, it was inclined toward the left shoulder. In 4 of his cases, operation gave excellent results.

Palsies Following Salvarsan. It is to be noted that all the more common secondary and tertiary lesions of syphilis have been observed after the use of salvarsan. Attention was first fixed on the optic nerve, until it was shown that optic neuritis and optic atrophy were certainly not more common, after treatment of syphilis with salvarsan, than they were after the mercurial or mixed treatment, and not so frequent as in untreated cases. More recently, palsies of the ocular muscles have been reported following injections of this drug, but not so commonly as optic neuritis. Jendralski² saw, after the use of salvarsan, 1 case of abducens paralysis, 2 of optic neuritis, 1 of neuroretinitis, and 1 of vitreous hemorrhage; most of these cases recovered under further treatment with salvarsan. Coppez³ saw a case in which, after a fourth dose of salvarsan (0.2 gram), paralysis of the inferior rectus muscle occurred. In this case, the Wassermann reaction was negative at the time the last dose was given, and Coppez is inclined to ascribe it to the meningotropism of the drug. Bistis⁴ has brought together a series of cases of ocular complications, including palsies of each of the ocular muscles, following the use of arsenobenzol; and he reports 1 of abducens paralysis seen by himself. He agrees entirely with the general verdict that these palsies are caused by syphilis, and there is nothing to indicate their dependence on the drug.

Hyperopia in Diabetes. Rapid failure of vision in diabetes usually suggests cataract. But, in a good many cases, it is due to a change in refraction in the eye. This may be an increase of refraction, myopia, which often precedes cataract. But, in more than 20 recorded cases, there was a suddenly developed hyperopia. Zentmayer⁵ reports a case occurring in a woman, aged fifty-eight years. She had been treated for three weeks for the glycosuria, and the sugar had disappeared from the urine. But there had been rapid loss of vision for ten

¹ Archives d'Ophtalmologie, xxxii, p. 338.

² Klinische Monatsblätter f. Augenheilkunde, April, 1912, p. 478.

³ Société Belge d'Ophtalmologie, No. 32, p. 99.

⁴ Zeitschrift f. Augenheilkunde, xxviii, p. 150.

⁵ Annals of Ophthalmology, xxi, p. 38.

days, so that now it was reduced to $\frac{6}{60}$; and she could see better at a distance with the glasses she had previously used for near work. Convex 2.50 D. spherical glasses gave her good vision. For three weeks there was no change in her refraction. Then the hyperopia began to diminish, and in about 4 months she required only +0.5 and +0.75, which gave her $\frac{6}{5}$ vision. In this, as in other reported cases, the hyperopia appeared with diminution of sugar in the urine. Zentmayer discusses the possible explanations for this phenomenon, viz., palsies of accommodation, rendering manifest a hyperopia previously latent; dehydration of the vitreous, with change of refraction; change of the index of refraction of the lens; and alteration of the corneal curvature. He finds the most probable explanation to be increase in the index of refraction of the cortical layers of the lens, which would diminish the refraction of the lens and the eye as a whole.

INJURIES

Burns from Fluid Core of Golf Balls. Within two months 4 cases were reported, and seven others referred to, of very serious injuries to the eye from a cause hitherto not recognized. Some golf balls are made with a core, consisting of a small rubber bag filled with a semifluid substance, which is extremely caustic. By the bursting of this bag, usually in the attempt to remove the cover, or cut the ball open, this substance is squirted into the eye, with most disastrous results. Wood's¹ patient, seen after a few hours, presented patches of burn over the face and hands. The lids were swollen shut. The conjunctiva was swollen and hyperemic. Two-thirds of the cornea was covered by a thin, whitish eschar; and there was marked scleral and ciliary injection. This patient recovered with vision $\frac{6}{12}$ minus. In a case seen by Carpenter² two hours after the injury, the entire bulbar and palpebral conjunctiva was transformed into a gray sloughing tissue; the cornea was opaque and milky, except the upper fifth; and the chemosis so great that the lids failed to cover the protruding conjunctiva. Severe iridocyclitis, hypopyon, and necrosis of the cornea developed. But, after 4 subconjunctival injections of large quantities of normal salt solution, the eye recovered with vision of $\frac{6}{6}$. Langdon³ states that the grayish paste filling the core of the English "Zodiac" golf ball, has a strongly alkaline reaction. In his case, he reports both eyes were involved; but at the end of two weeks had recovered so that vision was $\frac{5}{8}$ and $\frac{5}{6}$.

¹ Ophthalmic Record, xxi, p. 519.

² Transactions of Section on Ophthalmology, College of Physicians, Philadelphia, October 17, 1912.

³ Ibid.

The patient seen by Nance,¹ three weeks after the injury, was less fortunate. Almost the entire cornea was opaque, and there was an extensive symblepharon. Vision was reduced to light perception, and the eyeball was soft. Enucleation was advised.

Injury by Chrysarobin. This drug has been supposed to cause conjunctivitis, with marked photophobia. In every one of the 11 cases reported by Igersheimer,² the cornea presented minute gray dots, a *superficial punctate keratitis*. Both eyes are likely to be affected. The condition follows the handling of chrysarobin, or the use of a 10 per cent. salve on distant parts of the body. Instillation of atropine, warm fomentations, and protective glasses give relief.

Foreign Bodies in the Eyeball. The surgeon is apt to feel satisfied when he extracts one foreign body from the interior of the eyeball. Allport³ reports a case in which six separate particles of steel were found in an eyeball after its removal. The *x*-ray picture had shown but one large piece of steel. The smaller pieces are likely to be concealed by a large one. They are also less likely to come away with the magnet; and they may be quite capable of causing siderosis. Lauber⁴ saw a patient whose eye had received a foreign body three years before, and was now showing symptoms of *siderosis*. The foreign body was localized by the *x*-ray transillumination. But it was supposed to be copper, because the magnet did not affect it. It was removed with forceps, and proved to be non-magnetic iron.

Von Hippel⁵ reports 15 cases of *extraction of copper from the vitreous*. Eight of the eyes were saved; 1 blind, the others with vision varying from light perception to $\frac{5}{7}$. He also collects 58 cases from the literature in 41 of which the attempted extraction was successful. Of these, 32 eyes were retained, and 19 had some vision. Lange⁶ saw a splinter of *copper embedded in the crystalline lens*, which remained clear almost three years after the injury. He also saw a patient, aged sixteen years, with a perforation of the anterior capsule of the lens 1.5 mm. long. The lens was clouded so that vision was reduced to counting fingers at 3.5 meters. Later, the lens cleared, giving vision better than $\frac{1}{10}$. After fourteen years the condition remained the same, with a small central scar.

¹ Journal of Ophthalmology and Oto-Laryngology, vi, p. 361.

² Klinische Monatsblätter f. Augenheilkunde, May, 1912, p. 518.

³ Ophthalmic Record, xxii, p. 14.

⁴ Zeitschrift f. Augenheilkunde, xxix, p. 81.

⁵ Klinische Monatsblätter f. Augenheilkunde, July, 1912, p. 52.

⁶ Ibid., November, 1912, p. 553.



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